1968

551.483
Un32wmi
1967/68
pt. 1

[redacted]

[redacted]

Water Resources Data for Michigan

Part 1. Surface Water Records

[redacted]

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Prepared in cooperation with the State of Michigan
and with other agencies

United States Department of the Interior
Geological Survey - Water Resources Division

WATER RESOURCES DATA FOR MICHIGAN

1968

Part 1: Surface Water Records

Prepared in cooperation with

Michigan State Department of Natural Resources, through
- Water Resources Commission
- Geological Survey Division
- Fish Division
- Game Division
- Parks Division
- Engineering Division

Michigan Department of State Highways
Kalamazoo County Board of Supervisors
Macomb County Board of Supervisors
Macomb County Road Commission
Oakland County Department of Public Works
Oakland County Drain Commission
Genesee County Drain Commission
Wayne County Road Commission
Huron-Clinton Metropolitan Authority
Tri-County Regional Planning Commission
York Township
City of Dearborn
City of Detroit
City of Kalamazoo
City of Saline
Village of Imlay City
Village of Milan
Corps of Engineers, U. S. Army
Soil Conservation Service, U. S. Department of Agriculture
Fish and Wildlife Service, Department of Interior

Copies of this report may be obtained from
District Chief, Water Resources Division
U. S. Geological Survey
700 Capitol Savings & Loan Building
Lansing, Michigan 48933

1969

CALENDAR FOR WATER YEAR 1968

October 1967

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

November 1967

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

December 1967

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

January 1968

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

February 1968

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29		

March 1968

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

April 1968

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

May 1968

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

June 1968

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

July 1968

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

August 1968

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

September 1968

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

Water resources records, 1968, for Michigan are in the following reports of the U. S. Geological Survey:

1. Water Resources Data Michigan
   Part 1: Surface Water Records

2. Water Resources Data for Michigan
   Part 2: Water Quality Records

Digitized by the Internet Archive
in 2018 with funding from
University of Illinois Urbana-Champaign Alternates

https://archive.org/details/waterresourcesda1967geol

CONTENTS

Page

Introduction 1
Cooperation 2
Definition of terms and abbreviations 3
Downstream order and station numbers 4
Explanation of data 5
Accuracy of field data and computed results 8
Other data available 9
Hydrologic conditions 10
Gaging-station records 14
Streams tributary to Lake Superior
Washington Creek at Windigo, Mich. 14
Montreal River near Saxon, Wis. 18
Black River near Bessemer, Mich. 19
Presque Isle River at Marenisco, Mich. 20
Presque Isle River near Tula, Mich. 21
Middle Branch Ontonagon River near Paulding, Mich. 22
Bond Falls Reservoir:
Bond Falls Canal near Paulding, Mich. 23
Bond Falls Reservoir near Paulding, Mich. 24
Middle Branch Ontonagon River near Trout Creek, Mich. .. 25
East Branch Ontonagon River near Mass, Mich. 26
Middle Branch Ontonagon River near Rockland, Mich. 27
West Branch Ontonagon River near Bergland, Mich. 28
South Branch Ontonagon River:
Cisco Branch Ontonagon River at Cisco Lake Outlet, Mich. . 29
South Branch Ontonagon River at Ewen, Mich. 30
Ontonagon River near Rockland, Mich. 31
Sturgeon River (head of Portage River) near Sidnaw, Mich. 32
Sturgeon River near Alston, Mich. 33
Otter River near Elo, Mich. 34
Sturgeon River near Arnheim, Mich. 35
Trap Rock River near Lake Linden, Mich. 36
Carp River near Negaunee, Mich. 37
Chocolay River:
Cherry Creek near Harvey, Mich. 38
Tahquamenon River near Tahquamenon Paradise, Mich. 39
Streams tributary to Lake Michigan
Black River near Garnet, Mich. 40
Manistique River at Germfask, Mich. 41
Manistique River near Blaney, Mich. 42
Manistique River near Manistique, Mich. 43
Indian River near Manistique, Mich. 44
Sturgeon River near Nahma Junction, Mich. 45
Middle Branch Escanaba River at Humboldt, Mich. 46
Black River near Republic, Mich. 47
Middle Branch Escanaba River near Ishpeming, Mich. 48

CONTENTS

Page

Gaging-station records--Continued
Streams tributary to Lake Michigan--Continued
Middle Branch Escanaba River near Princeton, Mich. 49
Schweitzer Creek (head of East Branch Escanaba River):
Schweitzer Reservoir near Palmer, Mich. 50
Schweitzer Creek near Palmer, Mich. 51
Warner Creek near Palmer, Mich. 52
Goose Lake Outlet near Sands Station, Mich. 53
East Branch Escanaba River at Gwinn, Mich. 54
Escanaba River at Cornell, Mich. 55
Ford River near Hyde, Mich. 56
Brule River (head of Menominee River):
Iron River at Caspian, Mich. 57
Brule River near Florence, Wis. 58
Paint River at Crystal Falls, Mich. 59
Paint River near Alpha, Mich. 60
Peshekee River (head of Michigamme River) near Michigamme, Mich. 61
Peshekee River near Champion, Mich. 62
Michigamme River near Champion, Mich. 63
Michigamme River at Republic, Mich. 64
Michigamme River near Witch Lake, Mich. 65
Michigamme River near Crystal Falls, Mich. 66
Menominee River near Florence, Wis. 67
Pine River at Pine River powerplant, near Florence, Wis. 68
Sturgeon River:
West Branch Sturgeon River near Randville, Mich. ... 69
Sturgeon River near Foster City, Mich. 70
Menominee River near Pembine, Wis. 71
Pike River at Amberg, Wis. 72
Menominee River below Koss, Mich. 73
St. Joseph River near Burlington, Mich. 74
Coldwater River near Hodunk, Mich. 75
Nottawa Creek near Athens, Mich. 76
Portage River near Vicksburg, Mich. 77
Gourdneck Creek (head of Portage Creek):
Gourdneck Canal near Schoolcraft, Mich. 78
Gourdneck Creek near Schoolcraft, Mich. 79
St. Joseph River at Three Rivers, Mich. 80
Prairie River near Nottawa, Mich. 81
Fawn River near White Pigeon, Mich. 82
St. Joseph River at Mottville, Mich. 83
Pigeon Creek at Hogback Lake Outlet, near Angola, Ind. 84
North Branch Elkhart River near Cosperville, Ind. 85
Elkhart River at Goshen, Ind. 86
St. Joseph River at Elkhart, Ind. 87
St. Joseph River at Niles, Mich. 88
Dowagiac River at Sumnerville, Mich. 89
Paw Paw River at Riverside, Mich. 90

CONTENTS

Page

Gaging-station records--Continued
Streams tributary to Lake Michigan--Continued
Black River near Bangor, Mich. 91
Kalamazoo River at Marshall, Mich. 92
Battle Creek at Battle Creek, Mich. 93
Kalamazoo River near Battle Creek, Mich. 94
Augusta Creek near Augusta, Mich. 95
Gull Creek near Galesburg, Mich. 96
Kalamazoo River at Comstock, Mich. 97
Portage Creek near Kalamazoo, Mich. 98
West Fork Portage Creek at Kalamazoo, Mich. 99
Kalamazoo River near Fennville, Mich. 100
Rabbit River near Hopkins, Mich. 101
Black River near Zeeland, Mich. 102
Grand River at Jackson, Mich. 103
Grand River near Eaton Rapids, Mich. 104
Red Cedar River:
Deer Creek near Dansville, Mich. 105
Sloan Creek near Williamston, Mich. 106
Red Cedar River at East Lansing, Mich. 107
Grand River at Lansing, Mich. 108
Grand River at Portland, Mich. 109
Lookingglass River near Eagle, Mich. 110
Maple River at Maple Rapids, Mich. 111
Grand River at Ionia, Mich. 112
Flat River at Smyrna, Mich. 113
Thornapple River:
Quaker Brook near Nashville, Mich. 114
Thornapple River near Hastings, Mich. 115
Thornapple River near Caledonia, Mich. 116
Rouge River near Rockford, Mich. 117
Grand River at Grand Rapids, Mich. 118
Muskegon River near Merritt, Mich. 119
Clam River at Vogel Center, Mich. 120
Muskegon River at Evart, Mich. 121
Little Muskegon River near Morley, Mich. 122
Muskegon River at Newaygo, Mich. 123
Bear Creek near Muskegon, Mich. 124
White River near Whitehall, Mich. 125
Pere Marquette River at Scottville, Mich. 126
Big Sable River near Freesoil, Mich. 127
Manistee River near Grayling, Mich. 128
Manistee River near Sherman, Mich. 129
Pine River near Hoxeyville, Mich. 130
Manistee River near Manistee, Mich. 131
Little Manistee River near Freesoil, Mich. 132
Boardman River near Mayfield, Mich. 133
Jordan River near East Jordan, Mich. 134

CONTENTS

Page

Gaging-station records--Continued
Streams tributary to Lake Huron
Burt Lake (head of Cheboygan River):
Sturgeon River near Wolverine, Mich. 135
Indian River (outlet of Burt Lake) at Indian River, Mich. 136
Pigeon River near Vanderbilt, Mich. 137
Pigeon River at Afton, Mich. 138
Cheboygan River (continuation of Indian River) near Cheboygan, Mich. 139
Black River near Tower, Mich. 140
Rainy River near Ocqueoc, Mich. 141
Black River near Cheboygan, Mich. 142
Thunder Bay River near Hillman, Mich. 143
Thunder Bay River near Bolton, Mich. 144
North Branch Thunder Bay River near Bolton, Mich. 145
Au Sable River at Grayling, Mich. 147
East Branch Au Sable River at Grayling, Mich. 148
South Branch Au Sable River near Luzerne, Mich. 149
Au Sable River at Mio, Mich. 150
East Branch Au Gres River at McIvor, Mich. 151
Au Gres River near National City, Mich. 152
Rifle River:
Houghton Creek near Lupton, Mich. 153
Rifle River at "The Ranch" near Lupton, Mich. 154
Prior Creek near Selkirk, Mich. 155
Rifle River at Selkirk, Mich. 156
Shepards Creek:
South Branch Shepards Creek near Selkirk, Mich. 157
Rifle River near Sterling, Mich. 158
Kawkawlin River:
North Branch Kawkawlin River near Kawkawlin, Mich. ... 159
Shiawassee River (head of Saginaw River) at Linden, Mich. 160
Shiawassee River at Byron, Mich. 161
Shiawassee River at Owosso, Mich. 162
Shiawassee River near Fergus, Mich. 163
South Branch Flint River:
Farmers Creek near Lapeer, Mich. 164
Flint River:
Holloway Reservoir near Otisville, Mich. 165
Flint River near Otisville, Mich. 166
Kearsley Creek near Davison, Mich. 167
Swartz Creek near Holly, Mich. 168
Flint River near Flint, Mich. 169
Flint River near Fosters, Mich. 170
Flint River near Alicia, Mich. 171
South Branch Cass River near Cass City, Mich. 172
Cass River at Cass City, Mich. 173
Cass River at Vassar, Mich. 174
Cass River at Frankenmuth, Mich. 175

CONTENTS

Page

Gaging-station records--Continued
Streams tributary to Lake Huron--Continued
Tittabawassee River:
Tobacco River at Beaverton, Mich. 176
Salt River near North Bradley, Mich. 177
Chippewa River near Mount Pleasant, Mich. 178
Chippewa River near Midland, Mich. 179
Pine River at Alma, Mich. 180
Pine River near Midland, Mich. 181
Tittabawassee River at Midland, Mich. 182
Saginaw River at Saginaw, Mich. 183
Pigeon River near Owendale, Mich. 184
Streams tributary to St. Clair River
Black River near Fargo, Mich. 185
Mill Creek near Avoca, Mich. 186
Belle River:
North Branch Belle River at Imlay City, Mich. 187
Belle River at Memphis, Mich. 188
Streams tributary to Lake St. Clair
Clinton River:
Sashabaw Creek near Drayton Plains, Mich. 189
Clinton River near Drayton Plains, Mich. 190
Clinton River at Auburn Heights, Mich. 191
Galloway Creek near Auburn Heights, Mich. 192
Paint Creek near Lake Orion, Mich. 193
Paint Creek at Rochester, Mich. 194
Stony Creek near Romeo, Mich. 195
Stony Lake near Washington, Mich. 196
Stony Creek near Washington, Mich. 197
Red Run:
Big Beaver Creek near Warren, Mich. 198
Plum Brook at Utica, Mich. 199
Clinton River near Fraser, Mich. 200
North Branch Clinton River at Almont, Mich. 201
North Branch Clinton River near Romeo, Mich. 202
East Pond Creek at Romeo, Mich. 203
North Branch Clinton River near Meade, Mich. 204
Coon Creek near Armada, Mich. 205
East Branch Coon Creek at Armada, Mich. 206
Highbank Creek near Armada, Mich. 207
East Branch Coon Creek near New Haven, Mich. 208
North Branch Clinton River near Mount Clemens, Mich. . 209
Middle Branch Clinton River near Macomb, Mich. 210
Middle Branch Clinton River at Macomb, Mich. 211
Clinton River at Mount Clemens, Mich. 212
Streams tributary to Detroit River
River Rouge at Birmingham, Mich. 213
River Rouge at Southfield, Mich. 214
Evans Ditch at Southfield, Mich. 215
Upper River Rouge at Farmington, Mich. 216
River Rouge at Detroit, Mich. 217
Middle River Rouge near Garden City, Mich. 218
Lower River Rouge at Inkster, Mich. 219

CONTENTS

Page

Gaging-station records--Continued
Streams tributary to Lake Erie
Huron River at Commerce, Mich. 220
Huron River at Milford, Mich. 221
Huron River near New Hudson, Mich. 222
Ore Creek near Brighton, Mich. 223
Huron River near Hamburg, Mich. 224
Portage River near Pinckney, Mich. 225
Huron River near Dexter, Mich. 226
Mill Creek near Dexter, Mich. 227
Huron River at Ann Arbor, Mich. 228
River Raisin near Tecumseh, Mich. 229
River Raisin near Adrian, Mich. 230
Saline River near Saline, Mich. 231
River Raisin near Monroe, Mich. 232
Maumee River:
Bean Creek (head of Tiffin River) at Powers, Ohio 233
Discharge at partial-record stations and miscellaneous sites:
Low-flow partial-record stations 234
Crest-stage partial record stations 240
Measurements at miscellaneous sites 242
Low-flow investigations:
River Rouge basin, Mich. 246
Index 249

ILLUSTRATIONS

Figure 1. Comparisons of discharge at three long-term representative gaging stations during 1968 water year with median discharge for period 1931-60 11

Figure 2. Map showing identification number and location of gaging stations in Upper Peninsula of Michigan 12

Figure 3. Map showing identification number and location of gaging stations in Lower Peninsula of Michigan 13

WATER RESOURCES DATA FOR MICHIGAN, 1968

Part 1: Surface Water Records

INTRODUCTION

The surface-water records for the 1968 water year for gaging stations, partial-record stations, and miscellaneous sites within the State of Michigan are given in this report. For convenience there are also included records for a few pertinent gaging stations in bordering States. The records were collected and computed by the Water Resources Division of the U. S. Geological Survey, under the direction of A. D. Ash, district chief.

Through September 30, 1960, the records of discharge and stage of streams and contents and stage of lakes or reservoirs were published in an annual series of U. S. Geological Survey water-supply papers entitled "Surface Water Supply of the United States." Since 1951 there have been 20 volumes in the series; each volume covered an area whose boundaries coincided with those of certain natural drainage areas. The records in Michigan were contained in Part 4 of that series.

Beginning with the 1961 water year, streamflow records and related data have been released by the Geological Survey in annual reports on a State-boundary basis. Distribution of these basic-data reports is limited and primarily for local needs. Records will be published in Geological Survey water-supply papers at 5-year intervals.

COOPERATION

The systematic collection of streamflow records began in 1901 by cooperation with cities, municipalities, and private organizations. Cooperative agreements between the U. S. Geological Survey and organizations of the State of Michigan for the collection of streamflow records began in 1930. Organizations that supplied data are acknowledged in station descriptions. Organizations that assisted in collecting data through cooperative agreements with the Survey are:

Michigan State Department of Natural Resources Ralph A. MacMullen, director, Gaylord A. Walker, deputy director -- administration, through.-

Water Resources Commission, Loring F. Oeming, executive secretary.

Geological Survey Division, Gerald E. Eddy, chief.

Fish Division, Wayne H. Tody, chief.

Game Division, H. D. Ruhl, chief, succeeded by Donald W. Douglass.

Parks Division, Robert O. Dodge, chief.

Engineering Division, Harold C. MacSwain, chief.

Michigan Department of State Highways, Howard E. Hill, director, succeeded by Henrik E. Stafseth.

Assistance in the form of funds or services was given by the Corps of Engineers, U. S. Army, in collecting records for 29 gaging stations published in this report.

Assistance was also furnished by the U. S. Department of Commerce, ESSA, Weather Bureau, the Fish and Wildlife Service of the U. S. Department of the Interior, and the Soil Conservation Service, U. S. Department of Agriculture.

The following organizations aided in collecting records:

Kalamazoo County Board of Supervisors; Macomb County Board of Supervisors; Macomb County Road Commission; Oakland County Department of Public Works; Oakland County Drain Commission; Genesee County Drain Commission; Wayne County Road Commission; Huron-Clinton Metropolitan Authority; Tri-County Regional Planning Commission; York Township; cities of Allegan, Dearborn, Detroit, Kalamazoo, Lansing, and Saline; Villages of Imlay City and Milan; Consumers Power Co.; Cleveland-Cliffs Iron Co.; Hanna Coal and Ore Corp.; Michigan Gas and Electric Co.; Upper Peninsula Power Co.; and Wisconsin-Michigan Power Co.

The terms of streamflow and other hydrologic data, as used in this report, are defined as follows:

Gaging station is a particular site on a stream, canal, lake or reservoir where systematic observations of gage height or discharge are obtained. When used in connection with a discharge record, the term is applied only to those gaging stations where a continuous record of discharge is obtained.

Partial-record station is a particular site where limited streamflow data are collected systematically over a period of years for use in hydrologic analyses.

Cubic foot per second (cfs) is the rate of discharge of a stream whose channel is 1 square foot in cross-sectional area and whose average velocity is 1 foot per second.

Cubic feet per second per square mile (cfsm) is the average number of cubic feet of water flowing per second from each square mile of area drained, assuming that the runoff is distributed uniformly in time and area.

Runoff in inches (in.) shows the depth to which the drainage area would be covered if all the runoff for a given time period were uniformly distributed on it.

Acre-foot (ac-ft) is the quantity of water required to cover an acre to the depth of 1 foot and is equivalent to 43,560 cubic feet.

Cfs-day is the volume of water represented by a flow of 1 cubic foot per second for 24 hours. It is equivalent to 86,400 cubic feet, 1.983471 acre-feet, or 646,317 gallons, and represents a run-off of 0.0372 inch from 1 square mile.

Stage-discharge relation is the relation between gage height and the amount of water flowing in a channel, expressed as volume per unit of time.

Control designates a feature downstream from the gage that determines the stage-discharge relation at the gage. This feature may be a natural constriction of the channel, a long reach of the channel, or an artificial structure.

Contents is the volume of water in a reservoir or lake. Unless otherwise indicated, volume is computed on the basis of a level pool and does not include bank storage.

DEFINITION OF TERMS AND ABBREVIATIONS

The drainage area of a stream at a specified location is that area, measured in a horizontal plane, which is so enclosed by a topographic divide that direct surface runoff from precipitation normally would drain by gravity into the river above the specified point. Figures of drainage area given herein include all closed basins, or noncontributing areas, within the area unless otherwise noted.

WSP is used as an abbreviation for "Water-Supply Paper" in references to previously published reports.

DOWNSTREAM ORDER AND STATION NUMBERS

Stations are listed in the same downstream order used in the water-supply papers. Records are listed in a downstream direction along the main stem with all stations on a tributary entering above a main-stem station listed before that station. If a tributary enters between two main-stem stations, it is listed between them. A similar order is followed listing stations on first rank, second rank, and other ranks of tributaries. To indicate the rank of any tributary on which a gaging station is situated and the stream to which it is immediately tributary, each indention in the listing of gaging stations in the table of contents of this report represents one rank. This downstream order and systems of indention shows which gaging stations are on tributaries between any two stations on a main stem and the rank of the tributary on which each gaging station is situated.

As an added means of identification, each gaging station and partial-record station has been assigned a station number. The numbers have been assigned in the same downstream order used in the annual series of water-supply papers. In assigning station numbers, no distinction is made between partial-record stations and continuous-record gaging stations, so that the station number for a partial-record station indicates downstream order position in a list made up of both types of stations. Gaps are left in the numbers to allow for new stations that may be established; hence the numbers are not consecutive.

The complete 8-digit number for each station, such as 04-0425.00, includes the part number "04" plus a six digit number. In this report, the nonessential zeroes are not shown. For example, the complete number 04-0425.00 would appear as 4-0425, just to the left of the station name. All records for a drainage basin encompassing more than one State could be arranged in downstream order by assembling pages from the various State reports by station number to include all records in the basin.

The base data collected at gaging stations consist of records of stage and measurements of discharge. In addition, observations of factors affecting the stage-discharge relation, weather records, and other information are used to supplement base data in determining the daily flow. Records of stage are obtained from a water-stage recorder that gives a continuous chart of fluctuations (for digital recorders, a tape punched at 15-, 30-, or 60-minute intervals) or from direct readings on a nonrecording gage. Measurements of discharge are made with a current meter by the general methods adopted by the Geological Survey on the basis of experience in stream gaging since 1888. These methods are described in Water-Supply Paper 888 and are also outlined in standard textbooks on the measurement of stream discharge.

Rating tables giving the discharge for any stage are prepared from stage-discharge relation curves defined by discharge measurements. If extensions to the rating curves are necessary to define the extremes of discharge, they are made on the basis of indirect measurements of peak discharge (such as slope-area or contracted-opening measurements, or computation of flow over dams or weirs), velocity-area studies, and logarithmic plotting. The application of the daily mean gage height to those rating tables gives the daily mean discharge, from which the monthly and yearly mean discharge are computed. If the stage-discharge relation is subject to change because of frequent or continual change in the physical features that form the control, the daily mean discharge is determined by the shifting-control method, in which correction factors based on individual discharge measurements and notes by engineers and observers are used in applying the gage heights to the rating tables. If the stage-discharge relation for a station is temporarily changed by the presence of aquatic growth or debris on the control, the daily mean discharge is computed by what is in effect the shifting-control method.

At some gaging stations the stage-discharge relation is affected by backwater from reservoirs, tributary streams, or other sources. This necessitates the use of the slope method in which the slope or fall in a reach of the stream is a factor in determining discharge. Information required for determining the slope or fall is obtained by means of an auxiliary gage set at some distance from the base gage. At some stations the stage-discharge relation is affected by changing stage. For such stations, the rate of change in stage is used as a factor in determining discharge.

At some gaging stations the stage-discharge relation is affected by ice during the winter, and it becomes impossible to compute the discharge in the usual manner. Discharge for periods of ice effect is computed on the basis of the gage-height record and occasional winter discharge measurements, consideration being given to the available information on temperature and precipitation, notes by gage observers and engineers, and comparable records of discharge for other stations in the same or nearby basins.

For some gaging stations there are periods when no gage-height record is obtained or the recorded gage height is so faulty that it cannot be used to compute the daily discharge. This happens when the recorder stops or otherwise fails to operate properly, intakes are plugged, float is frozen in the well, or for various other reasons. For such periods the daily discharges are estimated on the basis of recorded range in stage, adjoining good record, discharge measurements, weather records, and comparison with other station records from the same or nearby basins.

The data in this report generally comprise a description of the station and a table showing the daily discharge and monthly and yearly discharge of the stream. Tables of daily mean gage height are included for some stations. Records are published for the water year which begins on October 1 and ends on September 30. A calendar for the 1968 water year is shown on page II to facilitate finding the day of the week for any date.

The description of the station gives the location, drainage area, records available, type and history of gages, average discharge, extremes of discharge, and general remarks. The location of the gaging station and the drainage area are obtained from the most accurate maps available. River mileage given under "Location" for some stations, is that determined and used by the Corps of Engineers unless otherwise noted. Under "Records available" are given periods for which there are published records for the present station or for stations generally equivalent to the present one. Under "Gage" are given the type of gage currently in use and the datum of the gage above mean sea level, and a condensed history of the types, locations, and datums of previous gages used during the period of records available. The references to "datum of 1929" and adjustments of other years are to the datum and adjustments of the U. S. Coast and Geodetic Survey. Under "Average discharge" is given the average discharge for the number of years indicated. It is not given for stations having fewer than five complete years of record or for stations where changes in water development during the period of record cause the figure to have little significance. Under "Extremes" are given the maximum discharge and gage height; the minimum discharge if there is little or no regulation; the minimum daily discharge if there is extensive regulation (also the minimum discharge if useful); and the minimum gage height if it is significant. In the first paragraph, the data given are for the complete current water year unless otherwise specified. In the second paragraph, the data given are for the periods of record within the calendar year dates in the heading (not necessarily those for the complete years indicated by the heading dates). Reliable information concerning major floods that have occurred outside the period of record are given in the third or last paragraph under "Extremes". Unless otherwise qualified, the maximum discharge corresponds to the crest stage obtained by use of a water-stage recorder, a crest-stage indicator, or a nonrecording gage read at the time of the crest. If the maximum gage height did not occur at the same time as the maximum discharge, it is given separately. Information pertaining to the accuracy of the records and to conditions which affect the natural flow at the gaging station is given under "Remarks".

GPO 817-436-2

The daily table gives the discharge corresponding to the daily mean gage height unless there are large or rapid changes in discharge during a day. For days having large or rapid changes, discharge for the day is computed by averaging the mean discharges for several parts of a day. For digital recorders, the daily mean discharge is always the average of the discharges at each punched reading. For stations equipped with nonrecording gages, the daily discharge corresponds to once-daily readings of the gage or to the mean of twice-daily readings; but for periods of rapidly changing stage the discharge is determined from a gage-height graph based on gage readings.

In the monthly summary below the daily table, the line headed "Total" gives the sum of the daily figures; it is the total cfs-days for the month. The line headed "Mean" gives the average flow in cubic feet per second during the month. The lines headed "Max" and "Min" give the figures for the maximum daily discharge and the minimum daily discharge for the month. Discharge for the month may be expressed in cubic feet per second per square mile (line headed "Cfsm"), or in inches (line headed "In."). Figures for cubic feet per second per square mile and runoff in inches are omitted if the drainage area includes large noncontributing areas.

In the yearly summary below the monthly summary, the figures of maximum are the maximum daily discharges, not the momentary discharges when the water was at crest stage. Likewise, the minimums in this summary are the minimum daily discharges.

Peak discharges and the times of their occurrence and corresponding gage heights for most stations are listed below the table of daily and monthly discharge. Time of day is expressed in 24-hour local standard time, for example 12:30 a.m. is 0030, 1:30 p.m. is 1330. All independent peaks above the selected base are given. The base discharge, which is given in parentheses, is selected so that an average of about three peaks a year can be presented. Peak discharges are not published for any stream for which the peaks are subject to substantial control by man.

In a general footnote, introduced by the word "Note", certain periods are indicated for which the discharge is computed or estimated by special methods because of no gage-height record, backwater from various sources, or other unusual conditions. Periods of no gage-height record are indicated if the period is continuous for a month or more or includes the maximum discharge for the year. Periods of backwater from an unusual source, of indefinite stage-discharge relation, or of any other unusual condition at the gage are indicated only if they are a month or more in length and the accuracy of the records is affected. Days on which the stage-discharge relation is affected by ice are not indicated. The methods used in computing discharge for various unusual conditions have been explained in preceding paragraphs.

ACCURACY OF FIELD DATA AND COMPUTED RESULTS

The accuracy of streamflow data depends primarily on (1) the stability of the stage-discharge relation or, if the control is unstable, the frequency of discharge measurements, and (2) the accuracy of observations of stage, measurements of discharge, and interpretation of records.

The station description under "Remarks" states the degree of accuracy of the records. "Excellent" means that about 95 percent of the daily discharges are within 5 percent; "good," within 10 percent; and "fair," within 15 percent. "Poor" means that daily discharges have less than "fair" accuracy.

Discharge at some stations, as indicated by the monthly mean, may vary widely from natural runoff, owing to diversion, consumption, regulation by storage, increase or decrease in evaporation due to artificial causes, or to other factors. For such stations, figures of cubic feet per second per square mile and of runoff in inches are not published unless satisfactory adjustments can be made for diversions, for changes in contents of reservoirs, or for other changes incident to use and control. Evaporation from a reservoir is not included in the adjustments for changes in reservoir contents, unless it is so stated. Even at those stations where adjustments are made, large errors in computed runoff may occur when relatively large negative adjustments are made or when evaporation is large in comparison with the observed discharge.

For some gaging stations the figures of mean daily discharge are shown to the nearest hundredth of a cfs for discharge less than 1 cfs. This has been done as a matter of uniformity in the computer program and should not be construed to indicate an accuracy greater than that used prior to 1966.

Data collected at partial-record stations and at miscellaneous sites are given at the end of this report. Data for partial-record stations are presented in two tables. The first is a table of discharge measurements at low-flow partial-record stations, and the second is a table of annual maximum stage and discharge at crest-stage stations. Discharge measurements at miscellaneous sites are given in a third table. Occasionally, a series of discharge measurements are made within a short time period to investigate the seepage gains or losses along a reach of a stream or to determine the low-flow characteristics of an area. Such measurements are given in special tables after the list of measurements at miscellaneous sites.

Information of a more detailed nature than that published for most of the gaging stations is on file in the district office, such as discharge measurements and recorder charts or nonrecording-gage readings. Gaging station records in the State through 1964 have been analyzed with an electronic computer to give: (1) the number of days in each year that the daily discharge was between selected limits (duration tables); (2) the lowest mean discharge for selected numbers of consecutive days in each year; and (3) the highest mean discharge for selected numbers of consecutive days in each year.

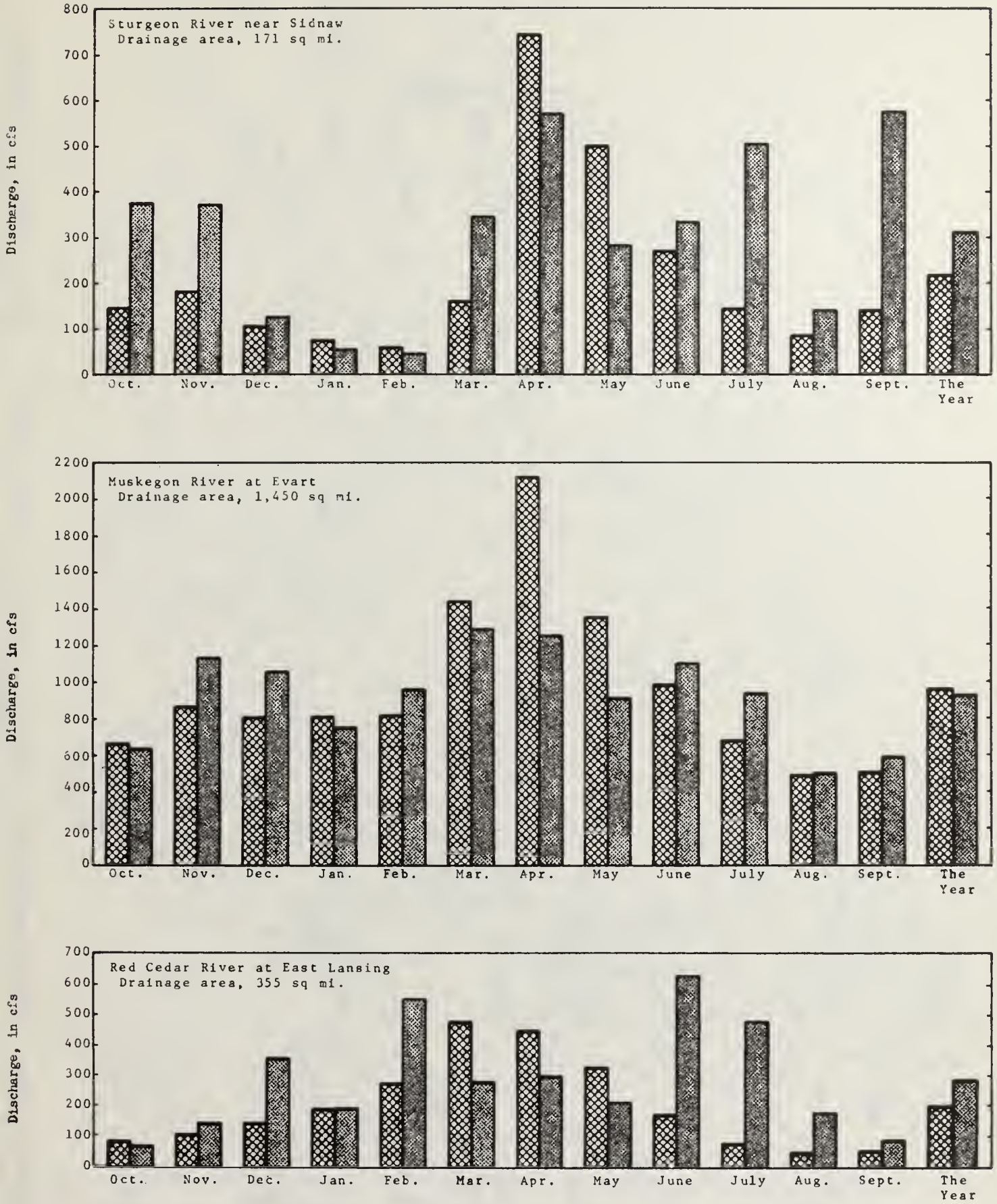
At or near some gaging stations, water-quality records also are collected. Data are obtained on the chemical quality of the stream water, on water temperature, on suspended-sediment concentration, and on the particle-size distribution of suspended sediment and bed material. These data are given in Part 2 of this report. Under the "Remarks" paragraph of the gaging-station description, reference is made to water-quality records collected on a regular basis.

HYDROLOGIC CONDITIONS

The water year 1968 was wet. Runoff for the year was excessive in the Upper Peninsula, and very nearly excessive in the southern part of the Lower Peninsula. Half of the months were in the excessive range.

At the index station Sturgeon River near Sidnaw, record high monthly means were established for November, July, and September. At the index station Red Cedar River at East Lansing, record monthly means were established for June and August.

Widespread flooding across the southern part of the Lower Peninsula was caused by heavy rains from June 23 to June 25. Most severely hit was metropolitan Detroit where many peaks were the highest in at least 20 years.



Explanation

Mean of monthly and yearly mean discharge for period 1931-60.

Monthly and yearly mean discharge for 1968 water year.

Figure 1.--Comparison of discharge at three long-term representative gaging stations during 1968 water year with median discharge for period 1931-60.

Figure 2.—Map showing identification number and location of gaging stations in Upper Peninsula of Michigan.

Figure 3.–Map showing identification number and location of gaging stations in Lower Peninsula of Michigan.

4-0010. Washington Creek at Windigo, Mich.

(Hydrologic bench-mark station)

Location.--Lat 47°55'23", long 89°08'42", in NW1/4 sec.28, T.64 N., R.38 W., on left bank 0.8 mile northeast of Windigo, and 35 miles southwest of Rock Harbor.

Drainage area.--13.2 sq mi.

Records available.--October 1964 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 605 ft (from topographic map).

Extremes.--Maximum and minimum discharges for water years 1965-68 are contained in the following table:

Water year	Maximum			Minimum		
	Date	Discharge (cfs)	Gage Height (feet)	Date	Discharge (cfs)	Gage Height (feet)
1965	Apr. 30, 1965	258	5.34	Feb. 4,5, 1965	0.80	2.66
1966	Apr. 24,25, 1966	462	6.25	On many days	1.5	+2.82
1967	Apr. 15, 1967	375	6.05	Sept. 11, 1967	.99	2.71
1968	Apr. 24, 1968	346	6.18	Mar. 7, 1968	.86	2.67

\+ occurred on Sept. 9, 1966

1965-68: Maximum discharge, 462 cfs Apr. 24, 25, 1966 (gage height, 6.25 ft); from rating curve extended above 60 cfs by logarithmic plotting and based on runoff characteristics of nearby stations; minimum, 0.80 cfs Feb. 4, 5, 1965 (gage height, 2.66 ft).

Remarks.--Records fair. Records of chemical analyses, water temperatures, and suspended sediment loads for the water year 1968 are published in Part 2 of this report. Previous quality water records published in Part 2 of corresponding year. Hydrologic bench mark stations are installed in specially selected areas where water resources have not yet been affected by works of man. Continuous records of natural hydrologic conditions, such as streamflow and water quality, will make possible assessment of changes which occur as a result of the changes in climate and other natural factors. These data will provide a frame of reference against which hydrologic changes wrought by man may be evaluated.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1964 TO SEPTEMBER 1965

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	4.0	2.7	1.4	1.0	1.0	1.0	1.0	192	16	18	4.7	7.7
2	3.7	2.6	1.5	1.0	.90	1.1	1.0	171	14	45	3.3	6.4
3	3.5	2.5	1.4	1.0	.90	1.1	1.0	150	12	33	2.5	4.9
4	3.4	2.5	1.4	1.0	.80	1.1	1.1	130	11	26	2.1	4.1
5	4.0	2.4	1.3	1.1	.90	1.1	2.4	120	11	22	1.9	3.8
6	7.0	2.4	1.4	1.1	.90	1.1	8.0	120	12	14	4.5	3.1
7	12	2.2	1.5	1.1	.90	1.1	13	160	12	8.7	6.0	3.3
8	15	2.1	1.5	1.1	.90	1.2	20	220	11	7.0	5.4	3.4
9	12	2.2	1.4	1.1	.90	1.2	35	160	11	6.1	4.4	2.9
10	10	2.5	1.4	1.1	1.0	1.2	32	100	11	5.6	3.4	2.6
11	8.0	3.0	1.5	1.1	1.0	1.2	30	70	9.6	5.4	2.7	2.6
12	6.0	4.2	1.5	1.0	1.0	1.2	30	45	8.1	5.0	2.7	2.3
13	5.5	4.5	1.5	1.0	1.0	1.2	34	37	6.9	8.0	2.8	2.7
14	4.5	4.3	1.5	1.0	1.0	1.2	37	30	6.0	8.0	2.4	3.2
15	4.0	4.0	1.4	1.0	1.0	1.2	39	65	5.5	7.0	2.1	26
16	3.5	3.7	1.4	1.0	1.0	1.2	34	78	4.9	6.0	2.0	22
17	3.2	3.4	1.3	1.0	1.0	1.2	41	63	4.3	5.4	2.1	20
18	3.0	3.0	1.3	1.0	1.0	1.2	55	46	4.3	4.5	2.4	18
19	3.0	2.5	1.2	1.0	1.0	1.2	81	35	4.2	4.0	1.9	17
20	3.2	1.9	1.2	1.0	1.0	1.2	83	28	4.2	3.5	1.8	17
21	4.1	1.5	1.1	1.0	1.0	1.1	96	121	4.2	3.0	1.7	14
22	5.4	1.3	1.1	1.0	1.0	1.1	109	125	4.0	3.3	1.6	14
23	4.6	1.4	1.1	1.0	1.0	1.1	97	70	3.7	3.0	1.4	12
24	4.0	1.4	1.1	1.0	.90	1.0	105	47	3.5	2.8	1.4	9.7
25	3.6	1.6	1.1	1.0	.90	1.0	113	38	4.0	2.8	1.8	8.2
26	3.4	1.5	1.1	1.0	1.0	.90	137	31	5.0	2.5	3.6	7.1
27	3.2	1.2	1.1	1.0	1.0	.90	133	27	11	2.1	7.1	6.4
28	3.3	1.5	1.1	1.0	1.0	.90	131	27	68	2.0	7.9	6.1
29	3.0	1.4	1.1	1.0	------	.90	187	25	38	1.7	6.2	6.0
30	2.8	1.3	1.1	1.0	------	1.0	236	22	24	1.5	5.2	20
31	2.7	------	1.1	1.0	------	.90	------	19	------	4.1	7.7	------
TOTAL	158.6	72.7	40.1	31.7	26.90	34.00	1,922.5	2,572	344.4	271.0	106.7	276.5
MEAN	5.12	2.42	1.29	1.02	.96	1.10	64.1	83.0	11.5	8.74	3.44	9.22
MAX	15	4.5	1.5	1.1	1.0	1.2	236	220	68	45	7.9	26
MIN	2.7	1.2	1.1	1.0	.80	.90	1.0	19	3.5	1.5	1.4	2.3
CFSM	.39	.18	.10	.08	.07	.08	4.85	6.29	.87	.66	.26	.70
IN.	.45	.20	.11	.09	.08	.10	5.42	7.25	.97	[illegible]	.30	.78

CAL YR 1964: TOTAL -- MEAN -- MAX -- MIN -- CFSM -- IN --
WAT YR 1965: TOTAL 5,857.10 MEAN 16.0 MAX 236 MIN .80 CFSM 1.22 IN 16.50

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1965 TO SEPTEMBER 1966

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	38	22	21	40	10	12	29	81	14	3.2	1.5	4.1
2	29	19	20	38	10	12	24	80	12	2.9	1.5	3.8
3	20	18	20	35	9.5	12	21	70	13	3.0	1.6	3.4
4	16	16	19	32	9.5	12	19	85	12	3.1	1.6	3.3
5	13	15	20	28	9.0	12	17	183	12	3.2	1.6	3.4
6	11	14	19	25	9.0	13	16	242	43	3.2	3.0	3.1
7	12	13	19	23	9.5	13	16	148	42	3.3	10	2.7
8	17	16	18	22	10	13	20	106	27	3.4	51	2.4
9	17	16	18	20	11	14	27	71	20	3.3	40	2.4
10	15	14	18	19	13	14	38	60	16	3.3	33	2.4
11	13	13	18	18	15	15	32	57	14	3.2	25	2.5
12	12	16	19	17	18	16	63	62	12	3.0	18	3.5
13	10	24	20	16	20	26	86	67	11	2.8	14	5.0
14	9.2	20	20	15	20	31	108	64	10	2.5	17	7.0
15	8.9	19	20	15	18	15	131	73	9.5	2.3	16	5.0
16	8.4	17	20	15	17	13	161	214	8.6	2.0	13	4.0
17	8.2	19	19	15	16	21	178	159	8.0	1.9	11	3.5
18	11	18	18	14	15	181	196	193	7.5	1.8	9.6	3.0
19	14	17	18	14	14	266	274	132	7.0	1.7	8.3	2.5
20	12	16	18	14	13	260	355	94	7.3	1.7	7.6	2.5
21	11	16	17	13	13	189	322	72	6.9	1.6	7.2	2.4
22	9.2	16	17	13	12	127	300	58	5.9	1.6	13	2.3
23	8.5	15	16	12	12	112	314	49	5.4	1.6	44	2.3
24	9.1	15	17	12	12	102	388	41	5.2	1.6	25	2.2
25	9.0	15	16	12	12	69	412	32	5.3	1.6	18	2.2
26	9.4	15	16	12	12	53	288	26	4.9	1.6	12	2.1
27	9.9	17	15	11	12	43	170	23	4.4	1.5	8.5	2.1
28	9.8	22	15	11	12	36	115	21	4.1	1.5	6.7	2.5
29	10	22	15	11	------	35	85	18	3.9	1.5	5.8	5.0
30	11	22	16	10	------	49	77	17	3.5	1.5	5.0	5.0
31	22	------	25	10	------	35	------	15	------	1.5	4.4	------
TOTAL	413.6	517	567	562	363.5	1,821	4,282	2,613	355.4	71.9	433.9	97.6
MEAN	13.3	17.2	18.3	18.1	13.0	58.7	143	84.3	11.8	2.32	14.0	3.25
MAX	38	24	25	40	20	266	412	242	43	3.4	51	7.0
MIN	8.2	13	15	10	9.0	12	16	15	3.5	1.5	1.5	2.1
CFSM	1.01	1.31	1.39	1.37	.98	4.45	10.8	6.39	.90	.18	1.06	.25
IN.	1.17	1.46	1.60	1.58	1.02	5.13	12.1	7.36	1.00	.20	1.22	.27

CAL YR 1965: TOTAL 7,083.3 MEAN 19.4 MAX 236 MIN .80 CFSM 1.47 IN 19.98
WAT YR 1966: TOTAL 12,097.9 MEAN 33.1 MAX 412 MIN 1.5 CFSM 2.51 IN 34.08

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1966 TO SEPTEMBER 1967

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	7.1	8.3	5.8	3.0	3.0	2.1	256	112	8.4	5.2	4.1	2.0
2	7.5	7.6	5.5	2.9	3.0	2.1	212	116	7.8	4.6	15	1.9
3	9.7	7.1	5.5	2.8	2.9	2.1	216	64	7.3	4.3	17	1.8
4	17	6.7	5.5	2.8	2.9	2.1	182	43	7.7	3.9	17	1.7
5	16	6.4	5.6	2.8	2.9	2.1	153	35	8.5	3.7	11	1.7
6	12	6.5	5.7	2.8	2.8	2.0	126	33	8.5	3.5	8.2	1.6
7	10	6.8	6.0	2.8	2.8	2.0	105	36	15	3.2	7.9	1.5
8	9.5	6.8	6.1	2.8	2.8	2.0	98	45	26	3.0	7.3	1.4
9	10	6.8	6.2	2.8	2.7	2.0	232	38	44	2.8	8.2	1.3
10	12	6.9	6.2	2.8	2.7	2.0	298	31	30	2.7	6.4	1.3
11	11	6.8	5.8	2.8	2.6	2.0	224	27	24	2.5	5.8	1.2
12	9.8	6.8	5.5	2.8	2.6	2.0	147	25	24	2.3	5.0	1.2
13	9.4	6.8	5.3	2.9	2.6	2.0	111	23	25	2.1	4.5	1.2
14	10	6.8	5.0	2.9	2.5	2.0	260	22	32	2.0	3.5	1.3
15	22	6.8	4.7	2.9	2.5	2.0	358	20	33	1.9	3.0	2.0
16	28	6.6	4.5	3.0	2.5	2.1	270	19	30	1.9	3.2	4.0
17	21	6.7	4.2	3.0	2.4	2.1	242	19	22	1.8	5.0	3.3
18	22	7.1	4.1	3.0	2.4	2.2	184	19	17	1.8	7.5	2.8
19	24	7.1	4.0	3.0	2.3	2.3	132	18	14	1.8	6.5	2.5
20	21	6.8	3.8	3.0	2.3	2.4	122	17	33	1.9	5.5	2.2
21	20	6.8	3.7	3.0	2.3	2.6	153	16	33	1.9	4.2	1.9
22	19	11	3.6	3.0	2.3	3.0	148	16	25	2.2	3.7	1.9
23	16	15	3.5	3.0	2.2	3.6	90	15	19	6.8	3.5	2.0
24	14	14	3.4	3.0	2.2	3.5	54	15	15	7.3	3.3	1.7
25	12	12	3.3	3.0	2.2	4.2	44	14	13	7.5	3.5	1.7
26	11	11	3.2	3.0	2.2	9.0	42	13	12	6.1	4.7	1.7
27	10	9.5	3.2	3.0	2.2	13	40	13	9.6	5.2	3.7	1.7
28	9.9	8.0	3.1	3.0	2.2	25	40	12	8.0	4.2	3.2	1.6
29	9.5	7.0	3.1	3.0	------	93	49	11	6.0	4.5	2.8	1.6
30	8.7	6.5	3.0	3.0	------	102	43	9.7	5.5	3.7	2.5	1.6
31	8.7	------	3.0	3.0	------	228	------	8.9	------	3.1	2.3	------
TOTAL	427.8	239.0	141.1	90.6	71.0	528.5	4,631	905.6	563.3	109.4	189.0	55.3
MEAN	13.8	7.97	4.55	2.92	2.54	17.0	154	29.2	18.8	3.53	6.10	1.84
MAX	28	15	6.2	3.0	3.0	228	358	116	44	7.5	17	4.0
MIN	7.1	6.4	3.0	2.8	2.2	2.0	40	8.9	5.5	1.8	2.3	1.2
CFSM	1.05	.60	.34	.22	.19	1.29	11.7	2.21	1.42	.27	.46	.14
IN.	1.21	.67	.40	.26	.20	1.49	13.0	2.55	1.59	.31	.53	.16

CAL YR 1966: TOTAL 11,408.2 MEAN 31.3 MAX 412 MIN 1.5 CFSM 2.37 IN 32.16
WAT YR 1967: TOTAL 7,951.6 MEAN 21.8 MAX 358 MIN 1.2 CFSM 1.65 IN 22.40

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.7	19	6.6	1.7	1.1	.95	130	46	38	13	14	8.5
2	1.7	16	6.3	1.6	1.1	.95	91	40	35	12	9.9	9.5
3	1.7	14	5.7	1.6	1.0	.94	65	38	30	10	8.4	8.5
4	1.7	16	5.6	1.5	1.0	1.0	54	35	25	13	7.4	12
5	1.7	13	5.4	1.5	1.0	.96	58	30	23	15	6.5	26
6	1.8	11	5.2	1.5	1.0	.90	36	27	68	12	6.0	25
7	2.0	10	5.1	1.4	1.0	.90	48	25	66	11	5.5	27
8	3.0	9.6	5.0	1.4	1.0	.94	99	24	90	9.9	5.0	25
9	5.0	12	4.8	1.4	1.0	1.2	138	24	71	8.1	4.5	34
10	7.5	14	4.6	1.3	1.1	1.3	133	22	58	7.0	4.0	26
11	6.5	25	4.4	1.3	1.2	1.2	104	20	59	11	3.5	19
12	5.0	26	4.2	1.3	1.3	1.2	109	19	45	19	3.2	15
13	4.5	21	4.0	1.3	1.3	1.2	102	18	34	16	6.2	12
14	5.0	18	3.8	1.3	1.3	1.1	148	17	47	84	4.6	11
15	4.0	14	3.7	1.2	1.3	1.2	127	17	38	56	4.4	10
16	3.2	11	3.6	1.2	1.2	1.4	103	29	29	36	8.7	8.9
17	3.1	12	3.5	1.2	1.2	2.8	114	47	24	25	16	8.7
18	3.1	11	3.4	1.2	1.1	33	94	37	24	19	11	13
19	3.1	10	3.5	1.3	1.1	122	64	29	26	17	12	12
20	3.1	8.7	3.7	1.3	1.0	153	62	25	21	15	9.3	11
21	3.1	8.1	4.0	1.3	1.0	153	128	21	18	28	8.2	11
22	3.1	8.4	4.5	1.2	.95	129	95	19	18	26	13	10
23	3.2	8.2	4.7	1.2	.95	98	100	35	28	19	39	11
24	4.0	7.7	4.5	1.2	.95	70	286	30	25	16	44	9.9
25	35	7.4	4.0	1.2	.95	44	130	24	19	13	24	9.4
26	43	7.2	3.5	1.2	.95	36	87	20	16	10	15	8.4
27	23	6.8	3.0	1.1	.95	71	78	71	14	9.1	11	7.6
28	17	7.1	2.5	1.1	.95	169	67	85	12	7.9	8.8	7.3
29	16	7.3	2.2	1.1	.95	296	60	63	13	6.9	7.7	6.9
30	26	7.3	2.0	1.1	------	216	54	46	11	6.5	7.1	7.1
31	22	------	1.8	1.1	------	164	------	36	------	20	6.5	------
TOTAL	263.8	366.8	128.8	40.3	30.90	1,774.14	2,964	1,019	1,025	571.4	334.4	410.7
MEAN	8.51	12.2	4.15	1.30	1.07	57.2	98.8	32.9	34.2	18.4	10.8	13.7
MAX	43	26	6.6	1.7	1.3	296	286	85	90	84	44	34
MIN	1.7	6.8	1.8	1.1	.95	.90	36	17	11	6.5	3.2	6.9
CFSM	.64	.93	.31	.10	.08	4.34	7.48	2.49	2.59	1.40	.82	1.04
IN.	.74	1.03	.36	.11	.09	5.00	8.35	2.87	2.89	1.61	.94	1.16

CAL YR 1967	TOTAL 7,903.1	MEAN 21.7	MAX 358	MIN 1.2	CFSM 1.64	IN 22.27
WTR YR 1968	TOTAL 8,929.24	MEAN 24.4	MAX 296	MIN .90	CFSM 1.85	IN 25.16

4-0300. Montreal River near Saxon, Wis.

Location.--Lat 46°32'45", long 90°24'05", in NW ¼ sec. 23, T. 48 N., R. 49 W., Michigan meridian, on right bank 2 miles upstream from mouth and 3.5 miles north of Saxon.

Drainage area.--262 sq mi.

Records available.--September 1938 to September 1968.

Gage.--Digital water-stage recorder. Altitude of gage is 760 ft (from power company data). Prior to Aug. 8, 1967, graphic water-stage recorder at present site and datum.

Average discharge.--30 years, 326 cfs.

Extremes.--Maximum discharge during year, 1,740 cfs May 16 (gage height, 4.18 ft); minimum daily discharge, 114 cfs Feb. 13.
1938-68: Maximum discharge, 6,600 cfs Apr. 24, 1960 (gage height, 7.50 ft); minimum, 2 cfs Sept. 21, Oct. 8, 1939, Sept. 9, 1965.

Remarks.--Records good except those for winter months and no gage-height record, which are fair. Diurnal fluctuation caused by Saxon Falls powerplant 1.5 miles upstream. Flow regulated by Gile Reservoir on West Branch Montreal River (capacity, 1,290,000,000 cu ft) since April 1941.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	203	695	220	178	196	204	626	472	641	752	250	215
2	200	670	246	174	196	200	514	383	655	769	286	211
3	195	639	238	180	194	200	426	322	573	656	330	216
4	194	535	174	190	192	208	437	400	474	535	250	255
5	192	420	188	204	190	208	420	404	371	305	216	247
6	191	370	200	210	191	202	456	380	313	217	202	225
7	210	340	200	224	190	206	555	345	268	222	202	204
8	254	320	200	234	189	204	579	204	264	183	206	225
9	218	350	200	240	186	180	650	218	543	254	190	503
10	298	450	198	246	170	158	560	198	559	183	208	549
11	312	746	196	250	160	170	462	203	618	178	204	423
12	276	1,070	190	252	124	235	397	208	811	225	202	313
13	277	925	184	254	114	250	354	200	935	283	204	237
14	270	665	180	256	136	266	346	216	886	313	214	191
15	234	488	180	258	180	290	384	254	753	360	240	182
16	214	360	184	258	178	350	359	1,130	542	288	212	181
17	190	350	190	256	162	410	344	1,550	353	226	206	189
18	184	350	190	252	152	540	347	1,440	259	365	202	208
19	258	310	192	248	156	610	311	1,450	279	403	204	190
20	236	280	200	240	180	616	306	1,220	282	310	212	197
21	199	260	198	232	188	560	441	1,000	344	254	206	201
22	188	240	194	228	186	520	443	906	588	203	204	199
23	186	230	188	220	192	478	451	1,050	612	181	202	302
24	194	220	186	212	196	427	777	773	622	186	200	305
25	230	218	186	206	194	458	704	685	549	190	202	245
26	284	212	192	204	192	500	633	602	391	210	206	234
27	350	202	202	202	200	678	805	1,030	554	310	208	228
28	428	186	206	200	204	1,100	884	1,380	631	470	208	214
29	358	188	204	198	206	1,170	709	1,310	518	320	208	201
30	324	200	194	196	------	954	565	943	492	256	207	189
31	620	------	184	196	------	775	------	682	------	242	207	------
TOTAL	7,967	12,489	6,084	6,898	5,194	13,327	15,245	21,558	15,680	9,929	6,698	7,479
MEAN	257	416	196	223	179	430	508	695	523	320	216	249
MAX	620	1,070	246	258	206	1,170	884	1,550	935	769	330	549
MIN	184	186	174	174	114	158	306	198	259	178	190	181
CFSM	.98	1.59	.75	.85	.68	1.64	1.94	2.65	1.99	1.22	.82	.95
IN.	1.13	1.77	.86	.98	.74	1.89	2.16	3.06	2.23	1.41	.95	1.06

CAL YR 1967: TOTAL 134,754 MEAN 369 MAX 3,900 MIN 115 CFSM 1.41 IN. 19.13
WTR YR 1968: TOTAL 128,548 MEAN 351 MAX 1,550 MIN 114 CFSM 1.34 IN. 18.25

Note.--No gage-height record Dec. 31 to Feb. 5, Feb. 19 to Mar. 13, July 24 to Aug. 27.

4-0310. Black River near Bessemer, Mich.

Location.--Lat 46°30'41", long 90°04'28", in NE 1/4 SE 1/4 sec.32, T.48 N., R.46 W., on right bank 450 ft downstream from bridge on county highway, 500 ft downstream from Powder Mill Creek, and 2.5 miles northwest of Bessemer.

Drainage area.--200 sq mi.

Records available.--October 1954 to September 1968.

Gage.--Digital water-stage recorder. Altitude of gage is 1,150 ft (from topographic map). Prior to July 15, 1965, graphic water-stage recorder at same site and datum.

Average discharge.--14 years, 233 cfs.

Extremes.--Maximum discharge during year, 3,470 cfs Mar. 19 (gage height, 8.21 ft); maximum gage height, 10.84 ft Mar. 19 (ice backwater); minimum daily discharge, 26 cfs Feb. 22-25.
1954-68: Maximum discharge, 14,800 cfs Apr. 24, 1960 (gage height, 14.27 ft, from floodmark), from rating curve extended above 5,300 cfs on basis of slope-area measurement of peak flow; minimum, 12 cfs July 19, 1962, July 28, 29, 1965.

Remarks.--Records good except those for winter months, which are fair. Prior to 1967, some ground water pumped from mines at Bessemer. Records of water temperatures for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	43	831	180	50	33	30	834	333	644	503	389	37
2	41	856	180	48	33	31	645	284	672	485	233	37
3	40	727	170	45	34	32	515	250	492	398	361	37
4	38	603	150	43	34	34	565	226	383	305	248	133
5	36	526	140	40	34	36	498	200	303	233	168	262
6	35	489	140	38	34	38	483	179	373	182	132	225
7	39	441	140	37	34	40	450	165	370	149	113	238
8	129	412	140	35	34	44	498	154	329	166	108	327
9	261	439	140	34	33	47	620	148	337	167	93	1,050
10	329	523	130	33	33	50	536	137	347	140	83	990
11	346	873	120	32	32	52	458	129	475	112	70	685
12	326	1,250	120	31	32	52	409	118	1,160	239	62	500
13	385	925	110	30	31	50	376	109	1,090	244	142	388
14	317	682	110	30	31	50	405	111	874	315	98	303
15	288	558	120	30	30	54	447	178	678	321	74	235
16	256	487	120	30	30	90	418	1,010	505	264	68	184
17	226	427	130	30	29	180	436	1,070	405	264	58	154
18	347	401	120	30	28	1,000	442	957	323	430	51	146
19	388	362	110	30	28	3,000	392	869	263	382	48	139
20	325	352	110	30	27	2,460	381	707	208	286	49	129
21	291	345	110	30	27	1,310	449	545	325	212	46	138
22	259	290	110	31	26	864	412	435	402	157	46	128
23	229	320	110	31	26	629	433	409	449	123	45	365
24	259	268	100	31	26	529	632	515	354	107	41	458
25	1,270	235	90	32	26	558	574	448	260	91	41	382
26	1,250	219	80	32	27	687	560	451	255	79	38	310
27	1,050	210	70	32	28	1,090	654	908	477	140	35	257
28	784	190	65	32	29	1,890	555	901	481	139	33	219
29	663	170	60	32	29	1,810	462	795	374	99	31	185
30	850	170	57	32	------	1,350	387	629	373	90	30	162
31	792	------	54	33	------	1,180	------	502	------	621	29	------
TOTAL	11,892	14,581	3,586	1,054	878	19,267	14,926	13,872	13,981	7,463	3,063	8,803
MEAN	384	486	116	34.0	30.3	622	498	447	466	241	98.8	293
MAX	1,270	1,250	180	50	34	3,000	834	1,070	1,160	621	389	1,050
MIN	35	170	54	30	26	30	376	109	208	79	29	37
CFSM	1.92	2.43	.58	.17	.15	3.11	2.49	2.24	2.33	1.20	.49	1.47
IN.	2.21	2.71	.67	.20	.16	3.58	2.78	2.58	2.60	1.39	.57	1.64

CAL YR 1967 TOTAL 116,463 MEAN 319 MAX 3,700 MIN 29 CFSM 1.60 IN 21.66
WTR YR 1968 TOTAL 113,366 MEAN 310 MAX 3,000 MIN 26 CFSM 1.55 IN 21.08

PEAK DISCHARGE (BASE, 1,500 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
03-19	1900	8.21	3,470	03-28	2100	6.01	2,030

4-0315. Presque Isle River at Marenisco, Mich.

Location.--Lat 46°22'20", long 89°41'32", in SE¼NW¼ sec.21, T.46 N., R.43 W., on left bank 0.3 mile upstream from highway bridge in Marenisco and 1½ miles downstream from confluence of East and West Branches.

Drainage area.--171 sq mi.

Records available.--February 1945 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 1,489.30 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to May 27, 1949, wire-weight gage at site 0.3 mile downstream at different datum. May 27, 1949 to July 15, 1968, graphic water-stage recorder at present site and datum.

Average discharge.--23 years, 174 cfs.

Extremes.--Maximum discharge during year, 812 cfs June 13 (gage height, 6.83 ft); minimum, 40 cfs Aug. 31 (gage height, 3.23 ft). 1945-68: Maximum discharge, 3,520 cfs Apr. 25, 1960 (gage height, 11.25 ft); minimum observed, 13 cfs Sept. 30, 1948 (gage height, 2.25 ft, site and datum then in use).

Remarks.--Records good except those for winter months, which are fair. Occasional regulation for lake or pond level control at several places above station.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	68	395	200	88	79	70	379	233	440	430	181	83
2	64	379	190	85	80	70	315	199	438	415	164	93
3	63	363	180	82	80	71	289	207	377	371	154	86
4	58	339	170	80	80	72	301	205	343	315	143	167
5	56	317	150	80	80	74	301	204	273	285	130	335
6	50	292	142	80	80	76	300	192	242	207	121	377
7	52	228	133	80	80	78	283	197	249	155	114	337
8	100	194	130	80	80	80	301	205	250	172	104	315
9	143	215	120	80	80	80	315	178	351	181	99	440
10	162	232	115	80	80	82	307	173	448	178	94	565
11	173	262	110	80	80	76	292	162	488	170	92	550
12	161	300	110	80	80	72	283	154	655	210	84	455
13	152	357	110	80	80	72	273	149	764	228	82	375
14	137	349	115	80	80	74	303	139	740	341	75	323
15	143	271	130	80	80	78	341	164	655	351	74	189
16	148	225	150	80	80	90	341	321	411	307	77	127
17	140	235	170	80	80	120	349	448	232	250	72	144
18	158	235	161	80	80	200	361	482	283	267	69	164
19	175	226	158	80	80	350	347	462	319	242	68	164
20	168	240	132	80	80	450	331	419	276	213	73	168
21	149	220	139	80	78	370	345	385	301	196	72	168
22	142	202	135	80	76	250	331	298	333	158	75	167
23	129	213	140	80	74	190	335	282	331	118	68	271
24	133	184	135	80	73	150	389	383	329	123	69	389
25	317	178	130	78	72	116	419	395	401	123	63	371
26	419	175	120	76	71	155	411	383	283	123	61	313
27	442	160	115	76	70	257	391	556	353	160	59	266
28	401	150	110	76	70	417	321	622	403	154	57	244
29	357	165	105	76	70	505	287	622	399	134	54	186
30	373	180	95	78	------	512	282	574	391	132	50	162
31	393	------	90	78	------	490	------	500	------	183	47	------
TOTAL	5,626	7,481	4,190	2,473	2,253	5,747	9,823	9,893	11,758	6,892	2,745	7,994
MEAN	181	249	135	79.8	77.7	185	327	319	392	222	88.5	266
MAX	442	395	200	88	80	512	419	622	764	430	181	565
MIN	50	150	90	76	70	70	273	139	232	118	47	83
CFSM	1.06	1.46	.789	.467	.454	1.08	1.91	1.87	2.29	1.30	.518	1.56
IN.	1.22	1.63	.91	.54	.49	1.24	2.13	2.16	2.56	1.50	.60	1.74

CAL YR 1967	TOTAL 79,781	MEAN 219	MAX 1,400	MIN 50	CFSM 1.28	IN 17.34
WTR YR 1968	TOTAL 76,875	MEAN 210	MAX 764	MIN 47	CFSM 1.23	IN 16.72

NOTE.--No gage-height record Jan. 7 to Feb. 7.

4-0320. Presque Isle River near Tula, Mich.

Location.--Lat 46°32'49", long 89°46'38", in NW¼ sec. 23, T.48 N., R.44 W., on downstream handrail of bridge on State Highway 28, 2 miles east of Tula, 5.5 miles downstream from Little Presque Isle River, and 7 miles southwest of Merriweather.

Drainage area.--261 sq mi.

Records available.--February 1945 to September 1968.

Gage.--Wire-weight gage, read once daily, and crest-stage gage. Datum of gage is 1,299.66 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources).

Average discharge.--23 years, 271 cfs.

Extremes.--Maximum discharge during year, 1,430 cfs Mar. 29 (gage height, 9.46 ft); maximum gage height, 10.59 ft Mar. 21 (ice jam); minimum discharge, 64 cfs Oct. 7 (gage height, 4.59 ft).
1945-68: Maximum discharge, 4,640 cfs Apr. 25, 1960 (gage height, 14.04 ft); minimum, 22 cfs Oct. 5, 6, 1948 (gage height, 4.22 ft).

Remarks.--Records fair. Occasional regulation for lake or pond level control at several places above station at Marenisco.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	96	726	310	130	110	100	924	400	700	574	419	120
2	94	738	330	130	110	100	744	359	726	600	324	140
3	91	729	300	125	110	100	597	319	675	552	280	128
4	91	777	260	120	110	105	503	315	572	500	240	171
5	88	774	230	120	110	105	523	300	477	398	212	328
6	92	661	210	120	110	110	539	291	487	328	173	539
7	64	513	200	120	110	110	510	280	572	250	150	574
8	70	419	190	115	110	115	508	280	602	205	144	552
9	150	398	180	115	110	115	642	284	518	249	140	712
10	250	426	170	115	110	120	600	266	529	240	140	999
11	300	513	170	115	110	120	597	258	608	227	130	1,040
12	330	600	160	120	110	115	549	240	891	597	117	861
13	290	700	160	120	110	110	500	231	1,060	675	179	670
14	240	660	160	120	110	110	520	229	996	680	159	513
15	250	560	200	120	110	110	563	277	900	670	125	371
16	260	500	220	120	110	120	591	429	771	639	123	258
17	242	420	250	120	110	150	600	658	608	600	114	181
18	286	380	260	120	110	250	591	709	390	563	105	210
19	364	390	240	120	110	600	574	700	260	647	97	227
20	342	400	210	120	110	1,200	534	670	357	503	99	231
21	326	380	200	120	110	1,000	540	619	376	400	110	255
22	290	360	210	120	110	600	529	500	443	280	112	250
23	255	350	210	120	105	430	500	424	470	205	114	251
24	233	330	200	115	105	280	600	505	484	190	104	474
25	412	310	200	115	100	220	647	602	438	173	92	523
26	885	290	180	110	100	200	636	630	410	159	88	474
27	975	280	170	110	100	350	636	692	434	218	85	405
28	984	250	160	110	100	600	580	909	563	240	80	340
29	870	250	150	110	100	1,100	536	930	569	214	75	288
30	678	280	150	110	------	1,260	469	852	560	179	78	236
31	689	------	140	110	------	1,060	------	750	------	260	72	------
TOTAL	10,587	14,364	6,380	3,655	3,130	11,065	17,382	14,908	17,446	12,215	4,480	12,321
MEAN	342	479	206	118	108	357	579	481	582	394	145	411
MAX	984	777	330	130	110	1,260	924	930	1,060	680	419	1,040
MIN	64	250	140	110	100	100	469	229	260	159	72	120
CFSM	1.31	1.83	.79	.45	.41	1.37	2.22	1.84	2.23	1.51	.55	1.57
IN.	1.51	2.05	.91	.52	.45	1.58	2.48	2.12	2.49	1.74	.64	1.76

CAL YR 1967: TOTAL 131,474 MEAN 360 MAX 2,460 MIN 64 CFSM 1.38 IN 18.73
WAT YR 1968: TOTAL 127,933 MEAN 350 MAX 1,260 MIN 64 CFSM 1.34 IN 18.23

4-0330. Middle Branch Ontonagon River near Paulding, Mich.

Location.--Lat 46°21'25", long 89°04'38", in SE 1/4 NE 1/4 sec.29, T.46 N., R.38 W., on right bank, 25 ft downstream from highway bridge, 2 1/4 miles upstream from Bond Falls Reservoir, and 5 3/4 miles southeast of Paulding.

Drainage area.--164 sq mi.

Records available.--June 1942 to September 1968. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Digital water-stage recorder. Datum of gage is 1,485.66 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Sept. 28, 1942, reference point on downstream side of bridge at present datum. Sept. 28, 1942, to Aug. 10, 1964, graphic water-stage recorder at present site and datum.

Average discharge.--26 years, 171 cfs.

Extremes.--Maximum discharge during year, 519 cfs Sept. 10 (gage height, 5.93 ft); maximum gage height, 6.16 ft Mar. 19 (ice jam); minimum discharge, 86 cfs Nov. 27 (gage height, 3.48 ft).
1942-68: Maximum discharge, 2,050 cfs Apr. 30, 1951 (gage height, 10.0 ft, from high-water mark); minimum, 27 cfs Nov. 22, 1946 (result of freeze-up); minimum gage height, 2.96 ft Nov. 26, 1942 (result of freeze-up).

Remarks.--Records fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	116	287	180	105	110	100	248	211	271	372	149	125
2	115	281	180	105	110	100	221	200	276	370	139	135
3	114	274	180	105	110	100	207	192	253	344	132	131
4	113	257	175	105	110	100	211	190	227	292	124	142
5	112	238	170	105	110	105	205	182	208	254	122	281
6	112	221	160	105	110	105	203	172	203	232	123	261
7	114	208	160	105	110	110	193	165	210	211	120	223
8	186	200	162	110	110	110	205	161	230	198	119	202
9	224	201	160	110	110	115	217	163	315	193	119	402
10	203	197	150	110	110	120	208	158	304	183	119	499
11	191	196	145	110	110	120	200	151	288	171	115	444
12	176	197	140	110	110	115	199	148	350	181	112	366
13	168	191	140	110	110	110	219	144	359	205	120	285
14	164	189	135	110	105	105	268	144	313	234	115	241
15	206	195	130	110	105	110	338	161	276	230	111	215
16	225	201	140	110	105	130	326	185	242	220	113	202
17	198	184	150	110	110	180	310	196	216	205	113	197
18	198	184	160	110	110	250	300	183	199	250	110	200
19	198	180	160	110	110	400	280	171	194	240	110	201
20	187	167	150	110	110	325	264	165	181	201	123	191
21	181	210	140	110	105	258	281	158	204	190	125	183
22	171	185	135	110	105	199	271	154	231	183	120	174
23	165	182	130	110	105	184	258	175	245	168	116	182
24	167	171	120	105	105	174	287	266	263	162	112	202
25	338	164	115	105	105	167	281	253	243	150	110	193
26	397	160	110	105	105	178	270	219	218	144	108	180
27	359	138	105	105	100	197	275	253	323	154	104	171
28	313	130	105	105	100	315	260	313	393	152	100	164
29	285	150	100	105	100	348	244	356	380	136	99	159
30	293	170	100	105	------	301	227	319	352	132	99	153
31	297	------	100	110	------	278	------	276	------	146	99	------
TOTAL	6,286	5,908	4,387	3,340	3,115	5,509	7,476	6,184	7,967	6,503	3,600	6,704
MEAN	203	197	142	108	107	178	249	199	266	210	116	223
MAX	397	287	180	110	110	400	338	356	393	372	149	499
MIN	112	130	100	105	100	100	193	144	181	132	99	125
CFSM	1.24	1.20	.86	.66	.65	1.08	1.52	1.22	1.62	1.28	.71	1.36
IN.	1.43	1.34	.99	.76	.71	1.25	1.70	1.40	1.81	1.47	.82	1.52

CAL YR 1967 TOTAL 74,610 MEAN 204 MAX 1,070 MIN 100 CFSM 1.25 IN 16.92
WTR YR 1968 TOTAL 66,979 MEAN 183 MAX 499 MIN 99 CFSM 1.12 IN 15.19

GPO 817-436-3

4-0335. Bond Falls Canal near Paulding, Mich.

Location.--Lat 46°23'57", long 89°08'47", in SW¼NE¼ sec.11, T.46 N., R.39 W., on left bank 40 ft upstream from intake to pipeline No. 2, 0.8 mile downstream from Bond Falls Reservoir on Middle Branch Ontonagon River, and 1.6 miles east of Paulding.

Records available.--July 1942 to September 1968.

Gage.--Staff gage and concrete control; gage read once daily. Datum of gage is 1,444.59 ft above mean sea level, datum of 1929.

Average discharge.--26 years, 135 cfs.

Extremes.--Maximum discharge during year, 327 cfs Sept. 17 (gage height, 2.92 ft); no flow May 18-21, Sept. 14; minimum gage height observed, -2.40 ft May 8-11 (two drain holes in weir closed, water surface below weir crest and canal gate closed).
1942-68: Maximum discharge, 373 cfs Sept. 23, 1960 (gage height, 3.17 ft); no flow at times each year since 1961; minimum gage height observed, -3.03 ft Apr. 17, 1963 (two drain holes in weir open and canal gate closed).

Remarks.--Records excellent except those below 15 cfs, which are poor. Canal diverts water from Bond Falls Reservoir (see sta. no. 0340) to South Branch Ontonagon River (see sta. no. 0395); water is used for power production at Victoria Dam near Rockland.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.2	10	133	300	305	300	4.5	5.6	9.4	298	309	180
2	6.0	10	133	301	305	305	4.5	6.0	9.4	298	307	180
3	6.0	93	133	301	305	305	4.5	5.9	9.4	298	305	180
4	6.0	260	133	301	305	305	4.5	5.8	9.8	298	305	180
5	6.0	260	133	300	305	305	4.5	3.9	62	213	303	180
6	6.0	260	133	300	303	305	4.5	2.9	46	152	303	119
7	132	185	133	300	303	301	4.5	1.2	11	152	303	83
8	171	70	133	300	301	305	5.2	1.2	10	152	301	83
9	8.5	70	133	300	305	305	5.2	1.2	10	152	301	46
10	8.5	71	133	301	305	319	6.0	1.2	10	152	298	8.4
11	7.6	71	133	301	300	307	5.2	1.2	11	210	298	4.7
12	7.6	71	159	301	300	312	5.2	1.2	11	251	303	4.4
13	8.0	71	177	300	300	310	4.5	1.3	11	168	301	2.3
14	8.0	71	193	300	300	303	5.2	1.3	11	109	305	0
15	8.0	71	237	300	300	305	5.2	1.7	11	109	303	119
16	8.0	71	260	300	305	301	6.0	1.8	12	109	301	270
17	8.0	72	260	300	305	296	6.0	.40	98	189	301	327
18	8.5	72	132	300	300	126	6.0	0	298	246	300	303
19	8.5	72	127	300	295	6.0	6.0	0	298	250	298	301
20	8.5	72	284	300	300	5.2	6.0	0	298	250	303	301
21	8.5	72	141	300	300	5.2	6.0	0	298	250	307	301
22	8.5	72	176	300	295	4.5	5.2	29	298	164	305	301
23	8.5	72	296	300	295	4.5	5.2	48	298	102	303	300
24	8.5	72	305	300	300	4.5	5.2	10	210	152	303	298
25	8.5	72	305	300	300	4.5	5.2	9.0	147	265	301	298
26	8.5	72	305	300	300	4.5	5.2	8.5	147	312	227	129
27	8.5	94	305	300	300	4.5	5.2	8.5	172	312	183	9.8
28	9.0	123	305	300	300	4.5	5.2	8.5	229	310	183	9.4
29	9.4	133	305	305	300	4.5	6.0	8.5	250	310	182	5.7
30	9.4	133	298	305	------	4.5	5.6	8.5	250	310	182	3.1
31	9.8	------	300	300	------	4.5	------	9.4	------	309	180	------
TOTAL	533.0	2.918	6.333	9.316	8.737	5.376.4	157.2	191.70	3.545.0	6.852	8.704	4.526.8
MEAN	17.2	97.3	204	301	301	173	5.24	6.18	118	221	281	151
MAX	171	260	305	305	305	319	6.0	48	298	312	309	327
MIN	5.2	10	127	300	295	4.5	4.5	0	9.4	102	180	0
CFSM	--	--	--	--	--	--	--	--	--	--	--	--
IN.	--	--	--	--	--	--	--	--	--	--	--	--

CAL YR 1967 TOTAL 69,969.30 MEAN 192 MAX 339 MIN 0 CFSM -- IN --
WTR YR 1968 TOTAL 57,190.10 MEAN 156 MAX 327 MIN 0 CFSM -- IN --

4-0340. Bond Falls Reservoir near Paulding, Mich.

Location.--Lat 46°24'29", long 89°07'42", in SW 1/4 sec.1, T.46 N., R.39 W., at Bond Falls Dam on Middle Branch Ontonagon River, 2 1/4 miles east of Paulding.

Drainage area.--190 sq mi.

Records available.--June 1942 to September 1968. Prior to October 1950, published in WSP 1307.

Gage.--Staff gage read once daily. Datum of gage is 1,335.59 ft above mean sea level, datum of 1929.

Remarks.--Reservoir is formed by earthfill and concrete dam with one taintor gate; dam completed in 1937. Usable capacity, 1,730,000,000 cu ft between gage heights of 120 ft (maximum drawdown) and 141 ft (full pond). Dead storage unknown. Water diverted to South Branch Ontonagon River (see sta. No. 395) through Bond Falls Canal (see sta. No. 335); water used for power production at Victoria Dam near Rockland.

Cooperation.--Gage-height record furnished by Upper Peninsula Power Co.

Month-end gage height and contents, water year October 1967 to September 1968

Date	Gage height (feet)*	Contents (millions of cubic feet)	Change in contents (millions of cubic feet)
Sept. 30	131.5	893	-
Oct. 31	137.0	1,390	+ 497
Nov. 30	139.1	1,600	+ 210
Dec. 31	136.4	1,340	- 260
Calendar year 1967	-	-	+ 90
Jan. 31	129.9	758	- 582
Feb. 29	123.0	203	- 555
Mar. 31	123.5	240	+ 37
Apr. 30	132.0	937	+ 697
May 31	137.3	1,420	+ 483
June 30	140.1	1,700	+ 280
July 31	138.6	1,550	- 150
Aug. 31	132.9	1,020	- 530
Sept. 30	135.4	1,240	+ 220
Water year 1967-68	-	-	+ 347

* Gage height at about 8:30 a.m.

4-0345. Middle Branch Ontonagon River near Trout Creek, Mich.

Location.--Lat 46°28'40", long 89°05'25", in SW¼ sec.8, T.47 N., R.38 W., on right bank 0.1 mile upstream from State Highway 28, 3-3/4 miles west of village of Trout Creek, and 7½ miles downstream from Bond Falls Reservoir.

Drainage area.--203 sq mi.

Records available.--June 1942 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 1,132.03 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Nov. 4, 1942, staff gage at same site and datum.

Average discharge.--26 years, 73.2 cfs.

Extremes.--Maximum discharge during year, 246 cfs June 16 (gage height, 2.57 ft); minimum discharge, 24 cfs Dec. 19 (gage height, 1.38 ft).

1942-68: Maximum discharge, 1,750 cfs Nov. 7, 1951 (gage height, 5.05 ft); minimum, 14 cfs sometime during period Jan. 23 to Feb. 13, 1947 (gage height, 1.14 ft, from recorded range in stage), caused by ice jams upstream.

Remarks.--Records excellent except those for winter months, which are fair. Flow regulated by Bond Falls Reservoir (see sta. no. 0340). Diversion to South Branch Ontonagon River (see sta. no. 0395) by Bond Falls Canal (see sta. no. 0335).

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	46	55	43	46	46	46	52	48	58	152	58	58
2	46	55	43	46	47	46	50	46	65	58	57	50
3	45	52	43	46	49	46	50	48	62	57	55	48
4	45	52	43	46	52	46	53	48	60	55	55	64
5	43	52	41	46	52	46	52	48	58	53	55	69
6	43	50	45	46	46	46	50	46	64	52	55	55
7	46	50	45	46	46	46	50	46	64	52	55	53
8	57	48	45	46	46	48	52	46	65	57	57	57
9	55	48	45	46	46	46	52	46	67	57	55	91
10	53	48	45	46	46	46	50	46	64	55	55	74
11	52	46	45	47	46	46	48	46	73	57	55	57
12	52	46	43	48	47	46	48	46	78	60	55	53
13	50	46	42	48	48	46	52	46	134	60	60	52
14	50	46	41	48	48	46	64	46	240	50	57	48
15	50	46	42	48	48	48	64	46	240	57	57	48
16	48	46	45	48	48	50	57	52	240	57	57	46
17	48	46	46	48	48	53	57	50	178	55	57	46
18	52	48	45	48	48	71	55	50	57	57	57	48
19	50	48	41	48	48	97	53	50	53	55	57	48
20	50	42	45	48	48	69	52	50	53	55	57	48
21	52	42	46	48	48	57	53	48	60	55	58	48
22	50	42	45	47	48	50	52	48	58	55	58	48
23	48	42	45	46	48	48	52	62	64	55	57	62
24	55	42	46	46	48	48	55	73	60	55	57	55
25	86	42	46	46	47	52	55	57	57	55	57	52
26	65	42	46	47	46	53	55	55	58	57	57	52
27	57	41	46	48	46	57	55	57	74	64	57	50
28	53	42	46	49	46	64	53	67	67	57	57	48
29	53	43	46	48	46	60	50	64	60	55	55	48
30	57	43	46	46	------	55	50	57	120	55	55	48
31	55	------	46	46	------	55	------	53	------	62	57	------
TOTAL	1,612	1,391	1,377	1,456	1,376	1,633	1,591	1,591	2,651	1,846	1,751	1,624
MEAN	52.0	46.4	44.4	47.0	47.4	52.7	53.0	51.3	88.4	59.5	56.5	54.1
MAX	86	55	46	49	52	97	64	73	240	152	60	91
MIN	43	41	41	46	46	46	48	46	53	52	55	46
CFSM	-	-	-	-	-	-	-	-	-	-	-	-
IN.	-	-	-	-	-	-	-	-	-	-	-	-

CAL YR 1967: TOTAL 17,732 MEAN 48.6 MAX 112 MIN 40 CFSM - IN -
WTR YR 1968: TOTAL 19,899 MEAN 54.4 MAX 240 MIN 41 CFSM - IN -

4-0350. East Branch Ontonagon River near Mass, Mich.

Location.--Lat 46°41'24", long 89°04'24", in SW 1/4 NW 1/4 sec.33, T.50 N., R.38 W., on right bank 700 ft downstream from abandoned highway bridge, 1,000 ft downstream from Adventure Creek, 5 miles south of Mass, and 7 1/2 miles upstream from mouth.

Drainage area.--272 sq mi.

Records available.--July 1942 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 873.55 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Oct. 1, 1949, wire-weight gage at bridge 700 ft upstream at present datum. Oct. 1, 1949, to Dec. 3, 1964, graphic water-stage recorder at present site and datum.

Average discharge.--26 years, 256 cfs.

Extremes.--Maximum discharge during year, 2,570 cfs Mar. 19 (gage height, 8.51 ft); minimum, 117 cfs Aug. 31 (gage height, 3.52 ft).
1942-68: Maximum discharge, 4,590 cfs July 1, 1953 (gage height, 10.57 ft); maximum gage height, 10.65 ft Apr. 24, 1960; minimum discharge, 60 cfs Aug. 25, 1948 (gage height, 3.55 ft, site then in use).

Remarks.--Records good except those for winter months, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	134	663	266	135	140	125	516	248	489	336	285	228
2	134	676	258	135	140	125	409	230	395	320	212	301
3	134	558	242	135	140	125	343	225	305	293	172	267
4	132	452	219	135	140	125	454	238	250	253	153	490
5	130	391	204	135	140	130	387	227	215	223	141	1,080
6	128	346	239	135	140	135	432	211	724	196	136	696
7	128	315	241	135	140	140	425	199	697	179	133	556
8	227	321	246	135	140	140	451	192	571	173	130	593
9	420	432	205	135	140	145	589	190	699	184	135	1,660
10	453	431	210	140	140	150	452	195	434	168	138	1,410
11	392	479	229	140	140	140	376	188	696	160	132	836
12	306	588	225	140	140	135	353	179	1,060	172	127	608
13	253	443	183	140	140	140	373	171	652	190	134	454
14	239	370	136	140	140	150	626	168	500	258	150	332
15	219	313	185	140	140	190	791	188	436	316	137	263
16	232	324	224	140	140	300	578	209	313	448	133	226
17	224	334	242	140	140	535	549	223	285	239	128	200
18	253	358	248	140	135	1,250	495	212	250	275	124	192
19	273	336	202	140	135	2,000	406	196	273	372	122	202
20	241	264	169	140	130	1,560	353	184	245	284	161	222
21	304	285	160	140	130	723	369	181	290	218	202	214
22	268	297	160	140	130	524	356	172	396	181	217	197
23	228	266	170	140	125	454	321	267	387	159	198	291
24	266	255	165	140	125	393	404	777	472	152	166	355
25	1,390	243	160	140	125	376	439	542	384	145	144	283
26	1,150	231	150	140	125	481	445	397	294	156	138	245
27	769	168	145	140	125	699	469	457	388	224	133	220
28	597	156	140	140	125	1,130	371	587	509	270	127	199
29	496	221	140	140	125	1,110	313	624	409	228	123	186
30	755	252	135	140	------	740	277	446	325	193	120	176
31	702	------	135	140	------	774	------	342	------	355	122	------
TOTAL	11,577	10,768	6,033	4,295	3,915	15,144	13,122	8,865	13,343	7,326	4,673	13,182
MEAN	373	359	195	139	135	489	437	286	445	236	151	439
MAX	1,390	676	266	140	140	2,000	791	777	1,060	448	285	1,660
MIN	128	156	135	135	125	125	277	168	215	145	120	176
CFSM	1.37	1.32	.72	.51	.50	1.80	1.61	1.05	1.64	.87	.55	1.62
IN.	1.58	1.47	.82	.59	.54	2.07	1.79	1.21	1.82	1.00	.64	1.80

CAL YR 1967 TOTAL 109,975 MEAN 301 MAX 2,450 MIN 115 CFSM 1.11 IN 15.04
WTR YR 1968 TOTAL 112,243 MEAN 307 MAX 2,000 MIN 120 CFSM 1.13 IN 15.35

PEAK DISCHARGE (BASE, 1,400 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT	DISCHARGE
10-25	2000	7.18	1,640	03-28	2200	6.95	1,500
03-19	1800	8.51	2,570	09-09	1500	7.62	1,930

Note.--No gage-height record Jan. 3 to Feb. 6.

4-0355. Middle Branch Ontonagon River near Rockland, Mich.

Location.--Lat 46°41'57", long 89°09'36", in SE¼ sec.27, T.50 N., R.39 W., on downstream side of bridge on U. S. Highway 45, 700 ft downstream from East Branch and 2.8 miles southeast of Rockland.

Drainage area.--671 sq mi.

Records available.--July 1942 to September 1968.

Gage.--Wire-weight gage read twice daily. Datum of gage is 661.1 ft above mean sea level, datum of 1929. Prior to Apr. 1, 1959, at site 400 ft upstream at same datum.

Average discharge.--26 years, 521 cfs.

Extremes.--Maximum discharge during year, 8,260 cfs Mar. 19 (gage height, 10.84 ft); minimum, 166 cfs July 9 (gage height, 4.29 ft).
1942-68: Maximum discharge, 27,000 cfs Aug. 22, 1942 (gage height, 21.2 ft, from floodmarks), from rating curve extended above 7,500 cfs on basis of slope-area measurement of peak flow; minimum observed, 142 cfs Dec. 3, 1963 (discharge measurement).

Remarks.--Records good except those for winter months, which are fair. Flow regulated by Bond Falls Reservoir (see sta. no. 0340). Diversion to South Branch Ontonagon River (see sta. no. 0395) by Bond Falls Canal (see sta. no. 0335).

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	244	1,260	470	240	250	230	910	436	1,210	790	478	350
2	230	1,260	478	240	250	230	730	396	700	532	348	444
3	230	690	450	240	255	235	680	372	570	428	286	396
4	230	730	420	240	255	240	1,080	380	444	380	272	1,000
5	224	650	370	240	255	250	680	308	380	293	251	2,600
6	218	580	310	240	255	260	830	332	1,980	286	244	1,050
7	218	610	350	240	255	270	810	300	1,820	279	244	750
8	372	523	340	250	250	280	840	300	1,600	258	237	1,150
9	710	720	350	250	250	300	1,170	308	1,650	218	251	5,680
10	820	750	396	250	250	300	850	316	900	286	230	3,020
11	800	770	400	250	255	285	680	300	1,100	272	224	1,430
12	560	980	404	250	260	260	630	279	1,980	308	230	900
13	452	750	300	250	260	260	630	258	1,150	332	251	610
14	428	600	206	250	260	270	1,160	265	960	428	265	460
15	396	530	260	255	260	290	1,590	332	890	505	230	388
16	372	505	308	260	260	496	1,030	364	800	630	251	372
17	348	530	420	260	255	800	1,000	412	670	380	230	286
18	436	720	444	260	255	3,640	870	372	412	412	230	300
19	560	600	360	260	250	6,550	700	340	404	444	230	308
20	428	420	308	260	245	3,640	590	316	372	396	244	332
21	560	450	300	260	240	1,350	680	293	514	340	324	316
22	460	452	330	260	240	850	600	300	690	286	364	293
23	388	430	320	260	240	610	532	460	670	265	332	452
24	532	412	300	260	235	600	790	1,820	780	265	258	790
25	2,840	400	290	260	235	590	830	930	550	230	260	469
26	2,660	388	270	260	230	340	730	700	444	251	258	404
27	1,550	350	260	255	230	1,200	1,030	1,020	800	436	251	380
28	1,090	324	260	255	230	1,920	680	1,380	910	436	230	332
29	950	400	250	255	230	1,870	514	1,330	620	340	230	300
30	1,940	460	250	255	------	1,250	496	820	487	316	224	286
31	1,400	------	250	255	------	1,450	------	590	------	770	218	------
TOTAL	22,646	18,244	10,424	7,820	7,195	31,616	24,342	16,349	26,457	11,792	8,175	25,848
MEAN	731	608	336	252	248	1,020	811	527	882	380	264	862
MAX	2,840	1,260	478	260	260	6,550	1,590	1,820	1,980	790	478	5,680
MIN	218	324	206	240	230	230	496	258	372	218	218	286
CFSM	--	--	--	--	--	--	--	--	--	--	--	--
IN.	--	--	--	--	--	--	--	--	--	--	--	--

CAL YR 1967	TOTAL 214,567	MEAN 588	MAX 9,880	MIN 206	CFSM --	IN --
WTR YR 1968	TOTAL 210,908	MEAN 576	MAX 6,550	MIN 206	CFSM --	IN --

4-0360. West Branch Ontonagon River near Bergland, Mich.

Location.--Lat 46°35'15", long 89°32'30", in SW 1/4 NE1/4 sec.3, T.48 N., R.42 W., on right bank 0.4 (revised) mile downstream from dam at outlet of Gogebic Lake and 1.5 miles east of Bergland.

Drainage area.--162 sq mi.

Records available.--July 1942 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 1,290.81 ft above mean sea level, datum of 1929. Prior to Nov. 5, 1942, staff gage 0.4 (revised) mile upstream at different datum. Nov. 5, 1942, to July 6, 1964, graphic water-stage recorder at present site and datum.

Average discharge.--26 years, 173 cfs.

Extremes.--Maximum discharge during year, 808 cfs May 28 (gage height, 4.62 ft); minimum daily, 2.0 cfs Oct. 22. 1942-68: Maximum discharge, 1,400 cfs Apr. 26, 1960 (gage height, 5.98 ft); minimum daily, 0.70 cfs Sept. 26 to Oct. 19, 1963; minimum gage height observed, 0.13 ft Oct. 2, 1963.

Remarks.--Records good except those below 20 cfs which are poor. Flow regulated by Gogebic Lake (usable capacity, 35,200 acre-ft).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.5	661	403	240	125	91	291	2.5	752	505	199	119
2	3.5	474	369	234	127	90	288	3.0	736	391	184	117
3	3.0	285	349	229	124	90	286	2.8	511	386	163	118
4	2.5	285	347	226	122	88	301	2.8	232	162	154	155
5	2.5	321	374	220	120	89	309	3.0	66	50	155	320
6	2.5	311	394	215	119	91	312	3.0	202	20	147	311
7	81	305	385	211	121	89	312	4.3	602	174	138	197
8	86	316	394	203	121	87	331	10	768	220	136	203
9	3.5	289	406	201	120	84	301	3.5	748	194	133	343
10	3.5	296	398	196	118	82	228	3.1	732	194	127	450
11	4.0	301	410	190	117	81	127	3.1	609	177	126	472
12	3.0	300	437	186	114	79	29	3.5	542	313	78	473
13	79	321	420	181	114	78	4.5	3.6	549	370	8.5	469
14	53	314	404	177	113	78	4.5	6.2	568	394	8.5	459
15	3.0	336	390	173	109	78	4.2	8.8	571	457	8.5	332
16	3.0	410	371	172	110	78	3.8	22	424	528	8.5	266
17	3.0	452	357	168	105	78	4.5	102	270	450	8.5	159
18	2.5	442	347	165	101	86	4.9	126	137	460	41	123
19	2.5	423	336	161	99	109	4.9	130	39	526	113	182
20	2.5	418	322	156	97	138	4.0	221	23	520	113	233
21	2.5	410	324	153	95	154	2.8	286	33	523	107	252
22	2.0	403	315	149	93	164	2.7	286	30	361	109	241
23	76	395	300	146	91	170	3.0	283	36	232	145	263
24	101	381	292	143	91	174	3.5	582	247	260	184	276
25	133	366	289	141	91	180	3.5	622	332	248	135	262
26	466	360	285	138	91	186	3.6	467	308	186	125	237
27	694	395	276	136	92	201	3.6	649	389	174	122	193
28	694	434	266	136	92	232	3.1	792	438	168	117	164
29	686	459	261	134	91	255	2.7	780	427	154	112	222
30	671	445	256	130	------	266	2.4	768	426	168	105	287
31	672	------	248	128	------	286	------	748	------	217	104	------
TOTAL	4,544.5	11,308	10,725	5,438	3,123	4,032	3,181.2	6,927.2	11,747	9,182	3,414.5	7,898
MEAN	147	377	346	175	108	130	106	223	392	296	110	263
MAX	694	661	437	240	127	286	331	792	768	528	199	473
MIN	2.0	285	248	128	91	78	2.4	2.5	23	20	8.5	117

CAL YR 1967	TOTAL 90,819.0	MEAN 249	MAX 968	MIN 2.0	CFSM 1.54	IN 20.90
WTR YR 1968	TOTAL 81,520.4	MEAN 223	MAX 792	MIN 2.0	CFSM 1.38	IN 18.78

4-0375. Cisco Branch Ontonagon River at Cisco Lake Outlet, Mich.

Location.--Lat 46°15'12", long 89°27'05", in E½ sec.32, T.45 N., R.41 W., on right bank 80 ft downstream from Cisco Lake Dam, 2½ miles upstream from Langford Creek, 5 miles upstream from U. S. Highway 2, and 13 miles west of Watersmeet.

Drainage area.--50.7 sq mi.

Records available.--October 1944 to September 1968.

Gage.--Staff gage read once daily. Datum of gage is 1,676.69 ft above mean sea level, datum of 1929.

Average discharge.--24 years, 46.1 cfs.

Extremes.--Maximum discharge during year, 240 cfs Oct. 27, 28 (gage height, 1.98 ft); minimum daily, 0.35 cfs Oct. 6.
1944-68: Maximum discharge, 288 cfs May 1-4, 1951 (gage height, 2.10 ft); minimum daily, 0.20 cfs May 29 to June 17, 1948, Nov. 8, 9, 1961.

Remarks.--Records fair except those below 5 cfs, which are poor. Flow regulated by Cisco Lake (usable capacity, 15,600 acre-ft).

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.90	200	27	40	45	19	85	2.2	66	155	14	2.0
2	.75	186	22	40	45	19	69	1.6	69	151	22	2.0
3	.60	176	22	40	45	19	61	1.6	66	151	22	2.0
4	.50	171	22	40	45	19	61	1.6	66	146	22	38
5	.40	171	22	40	45	26	64	1.6	61	187	22	132
6	.35	166	22	38	45	29	64	1.9	64	183	23	178
7	.40	153	22	23	45	29	64	1.9	64	137	26	160
8	15	153	23	14	45	40	66	1.6	61	71	29	137
9	35	144	23	14	45	45	48	1.6	66	29	26	164
10	40	140	29	14	34	45	36	1.6	154	19	11	198
11	58	136	31	14	29	45	36	1.6	181	19	2.4	188
12	66	132	31	14	29	34	14	1.6	164	22	2.0	165
13	66	128	31	14	29	29	1.3	1.6	164	43	2.0	178
14	22	124	31	15	29	29	1.6	1.9	160	116	2.0	136
15	2.4	120	39	15	29	29	1.6	1.6	155	155	2.0	115
16	2.0	117	42	15	29	29	1.6	1.6	151	146	2.0	54
17	2.0	113	42	16	29	29	1.9	3.7	151	142	2.0	18
18	2.0	113	42	16	29	29	1.9	5.1	142	178	2.0	19
19	2.0	113	42	25	29	66	1.9	5.1	134	193	2.0	27
20	76	95	42	28	29	99	1.9	2.8	130	155	25	31
21	109	79	45	28	29	108	1.9	1.6	134	142	75	31
22	124	75	42	28	29	104	1.9	2.7	128	58	98	31
23	140	75	42	28	29	88	1.9	14	126	14	94	88
24	149	64	42	28	29	80	2.2	65	126	7.0	45	122
25	153	61	42	28	29	77	2.2	115	122	2.4	7.1	111
26	166	59	42	28	29	56	2.2	127	130	2.4	2.0	68
27	216	59	42	28	25	45	2.2	154	134	2.4	2.0	45
28	240	59	42	39	22	72	2.2	169	126	2.4	2.0	45
29	230	56	42	45	19	88	2.2	151	122	2.4	2.0	45
30	216	42	40	45	------	88	2.2	114	122	2.4	1.7	45
31	206	------	40	45	------	85	------	79	------	2.4	1.7	------
TOTAL	2,341.30	3,480	1,068	845	969	1,599	702.8	1,036.1	3,539	2,635.8	590.9	2,565.0
MEAN	75.5	116	34.5	27.3	33.4	51.6	23.4	33.4	118	85.0	19.1	85.5
MAX	240	200	45	45	45	108	85	169	181	193	98	198
MIN	.35	42	22	14	19	19	1.3	1.6	61	2.4	1.7	2.0
CFSM	--	--	--	--	--	--	--	--	--	--	--	--
IN.	--	--	--	--	--	--	--	--	--	--	--	--

CAL YR 1967:	TOTAL	20,273.10	MEAN	55.5	MAX	240	MIN	.35	CFSM	1.09	IN	14.80
WAT YR 1968:	TOTAL	21,371.90	MEAN	58.4	MAX	240	MIN	.35	CFSM	1.15	IN	15.65

4-0395. South Branch Ontonagon River at Ewen, Mich.

Location.--Lat 46°31'58", long 89°16'37", in NW 1/4 sec.26, T.48 N., R.40 W., on left bank on piers of Old State Highway 28 bridge in Ewen, 150 feet upstream from railroad bridge, and 800 feet upstream from present State Highway 28 bridge.

Drainage area.--348 sq mi.

Records available.--Water years 1939-42 (annual maximums in WSP 1307), April 1942 to September 1968.

Gage.--Staff gage, read twice daily, and crest-stage gage. Datum of gage is 1,113.04 ft above mean sea level, datum of 1929. Prior to Jan. 16, 1943, reference mark or chain gage on upstream side of bridge at same site and datum.

Average discharge.--26 years, 491 cfs.

Extremes.--Maximum discharge during year, 2,820 cfs Mar. 20 (gage height, 12.42 ft); minimum, 96 cfs, Oct. 7 (gage height, 0.96 ft).

1939-68: Maximum discharge, 13,500 cfs Apr. 24, 1960 (gage height, 22.07 ft, from floodmark), from rating curve extended above 6,400 cfs on basis of contracted-opening measurement of peak flow.

1942-68: Minimum discharge, 68 cfs July 26, 27, 1963 (gage height, 0.55 ft).

Remarks.--Records good except those for winter months, which are fair. Some diversion from Middle Branch Ontonagon River by Bond Falls Canal (sta. no. 0335). Some regulation at medium and low flows by Cisco Lake (usable capacity, 15,600 acre-ft).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	108	1,250	500	440	460	420	858	399	796	1,110	580	290
2	106	1,160	480	440	460	420	682	352	959	1,110	524	347
3	105	1,080	450	440	460	430	572	316	759	930	482	329
4	105	1,090	400	440	460	430	616	299	568	812	480	426
5	100	1,040	360	430	460	440	673	276	462	754	471	1,320
6	98	952	350	400	450	450	757	253	640	592	457	1,270
7	100	886	340	390	450	460	666	230	895	576	457	882
8	326	630	331	390	450	470	624	215	904	558	467	871
9	339	735	312	390	450	480	691	208	1,140	570	462	1,680
10	336	754	340	400	450	496	671	201	1,030	473	453	2,370
11	428	728	318	400	450	476	568	189	816	476	446	2,270
12	397	728	318	400	450	455	506	178	1,090	614	428	1,400
13	355	717	348	400	450	500	516	174	1,150	710	442	838
14	352	677	439	400	450	450	570	166	871	757	430	636
15	326	576	693	410	450	421	930	182	772	790	412	532
16	352	612	831	410	450	442	860	254	626	560	397	612
17	276	606	853	410	450	496	735	401	560	582	392	675
18	289	604	546	410	450	970	730	363	699	814	382	596
19	390	612	223	420	450	1,930	636	337	732	911	379	552
20	358	498	538	420	450	2,670	534	312	691	757	395	536
21	316	602	560	420	450	2,150	568	286	717	688	424	540
22	344	536	408	430	440	959	562	250	873	630	437	528
23	360	444	390	430	440	651	494	342	928	451	475	620
24	366	417	410	440	430	556	588	926	1,030	424	492	860
25	1,280	406	420	440	430	512	664	1,100	809	397	484	906
26	2,060	380	430	440	420	578	584	783	671	460	488	816
27	2,080	372	440	450	420	710	724	937	1,030	506	310	504
28	1,430	350	440	450	420	926	669	1,270	1,430	518	268	387
29	1,040	450	440	450	420	1,200	556	1,400	1,450	478	253	339
30	1,140	490	440	450	------	1,020	473	1,130	1,080	451	251	304
31	1,310	------	440	450	------	926	------	867	------	508	246	------
TOTAL	16,972	20,382	13,788	13,090	12,920	23,494	19,277	14,596	26,178	19,967	13,064	24,236
MEAN	547	679	445	422	446	758	643	471	873	644	421	808
MAX	2,080	1,250	853	450	460	2,670	930	1,400	1,450	1,110	580	2,370
MIN	98	350	223	390	420	420	473	166	462	397	246	290

CAL YR 1967: TOTAL 239,854 MEAN 657 MAX 5,580 MIN 98
WAT YR 1968: TOTAL 217,964 MEAN 596 MAX 2,670 MIN 98

PEAK DISCHARGE (BASE, 2,000 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
10-27	0200	10.75	2,220	09-10	2000	11.66	2,530
03-20	1900	12.42	2,820				

4-0400. Ontonagon River near Rockland, Mich.

Location.--Lat 46°43'15", long 89°12'25", in NE 1/4 sec.20, T.50 N., R.39 W., on left bank, 50 ft downstream from bridge on highway between Rockland and Victoria, 1.8 miles southwest of Rockland and 2.4 miles downstream from confluence of Middle and West Branches.

Drainage area.--1,340 sq mi.

Records available.--June 1942 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 638.72 ft above mean sea level, datum of 1929. Prior to Nov. 23, 1943, wire-weight, chain, and staff gages on downstream side of bridge 50 ft upstream at present datum. Nov. 23, 1943, to Aug. 14, 1963, graphic water-stage recorder; Aug. 15, 1963 to Oct. 17, 1967, digital water-stage recorder on downstream side of left bridge pier 50 ft upstream at present datum.

Average discharge.--26 years, 1,393 cfs.

Extremes.--Maximum discharge during year, 15,400 cfs Mar. 19 (gage height, 15.97 ft); minimum daily, 362 cfs Oct. 7.

1942-68: Maximum discharge, 42,000 cfs Aug. 22, 1942 (gage height, 28.6 ft, from floodmark), from rating curve extended above 14,000 cfs on basis of slope-area measurement of peak flow; minimum daily, 192 cfs July 28, 29, 1963.

Remarks.--Records good except those for winter months, which are fair. Flow regulated by Victoria powerplant on West Branch 5 miles above station, by Bond Falls Reservoir (usable capacity 39,700 acre-ft), and by Gogebic and Cisco Lakes (combined lake usable capacity, 50,800 acre-ft).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	468	3,820	1,230	1,100	890	810	2,590	1,150	3,120	2,600	1,410	1,120
2	453	3,660	1,250	1,110	870	830	2,140	807	3,160	2,420	1,240	838
3	464	2,980	1,230	1,110	850	860	1,680	858	2,360	2,020	1,200	910
4	408	2,330	1,280	1,100	840	920	2,320	701	1,710	1,760	1,140	1,370
5	372	2,320	1,140	1,080	850	1,000	2,240	811	1,290	1,300	1,120	4,330
6	372	2,140	1,120	1,070	860	1,150	2,460	679	4,350	1,190	1,110	3,450
7	362	1,880	1,240	1,060	880	1,100	2,570	634	6,080	964	1,100	2,310
8	575	1,790	1,300	1,060	860	1,050	2,200	639	4,740	1,040	1,060	2,260
9	1,160	1,920	1,300	1,080	840	1,000	2,880	605	4,110	1,170	1,080	9,380
10	1,360	2,390	1,160	1,130	800	960	2,380	595	3,120	1,120	1,040	7,550
11	1,330	2,280	1,130	1,120	810	930	1,650	605	3,110	996	1,060	4,980
12	892	2,510	1,150	1,070	850	900	1,590	584	4,490	1,030	895	3,590
13	954	2,300	1,230	1,000	880	890	1,550	538	3,300	1,260	1,020	2,430
14	1,300	1,940	922	940	860	910	2,170	543	2,910	1,540	725	1,670
15	862	1,530	947	920	850	950	2,770	567	2,450	2,050	689	1,600
16	1,020	1,540	1,060	1,000	840	1,150	2,310	761	2,150	2,050	687	1,470
17	1,160	1,680	1,120	1,070	810	1,800	2,090	1,040	1,830	1,670	680	1,280
18	1,240	2,110	1,260	1,100	810	5,000	1,920	1,090	1,430	1,830	678	1,270
19	1,370	2,010	1,410	1,060	810	13,300	1,710	995	1,360	2,130	676	1,250
20	996	1,490	1,170	1,000	810	10,200	1,520	945	1,300	1,860	591	1,270
21	640	1,470	1,370	970	800	5,460	1,550	1,030	1,390	1,650	650	1,260
22	585	1,520	1,450	960	800	3,030	1,520	943	1,740	1,480	716	1,240
23	665	1,420	1,160	950	790	2,110	1,410	1,210	2,000	1,240	773	1,360
24	802	1,310	1,100	930	790	1,670	1,480	3,370	1,940	1,140	741	1,940
25	7,680	1,300	1,100	920	790	1,870	1,740	3,440	2,130	1,020	717	1,970
26	7,530	1,270	1,050	920	790	2,310	1,790	2,500	1,680	949	711	1,690
27	5,440	1,090	1,050	920	790	3,280	2,340	2,780	2,140	1,270	638	1,430
28	4,210	772	1,020	910	790	5,430	1,900	3,970	3,220	1,060	577	1,270
29	3,300	996	1,010	910	800	5,560	1,600	4,120	3,000	1,090	551	1,090
30	4,090	1,140	1,010	910	------	3,840	1,360	3,230	2,330	1,000	647	854
31	3,960	------	1,050	910	------	3,370	------	2,590	------	1,590	615	------
TOTAL	56,020	56,908	36,019	31,390	24,010	83,640	59,430	44,330	79,940	45,489	26,537	68,432
MEAN	1,807	1,897	1,162	1,013	828	2,698	1,981	1,430	2,665	1,467	856	2,281
MAX	7,680	3,820	1,450	1,130	890	13,300	2,880	4,120	6,080	2,600	1,410	9,380
MIN	362	772	922	910	790	810	1,360	538	1,290	949	551	838

CAL YR 1967 TOTAL 619,066 MEAN 1,696 MAX 15,400 MIN 362 CFSM 1.27 IN 17.24
WTR YR 1968 TOTAL 612,145 MEAN 1,673 MAX 13,300 MIN 362 CFSM 1.25 IN 17.43

PEAK DISCHARGE (BASE, 9,000 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
10-25	1800	14.44	12,300	09-09	1100	15.29	14,000
03-19	0400	15.97	15,400				

4-0405. Sturgeon River near Sidnaw, Mich.

Location.--Lat 46°35'03", long 88°34'33", in NE¼SE¼ sec.5, T.48 N., R.34 W., on right bank 30 ft downstream from highway bridge, 3 miles downstream from Rock River, 3½ miles northwest of Covington, 6½ miles upstream from Perch River, 8½ miles northeast of Sidnaw, and at mile 71.

Drainage area.--171 sq mi.

Records available.--October 1912 to September 1915, April 1943 to September 1968. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Water-stage recorder. Datum of gage is 1,214.40 ft above mean sea level, datum of 1929. October 1912 to September 1915, staff gage at site 200 ft upstream at different datum. Apr. 2, 1943, to Oct. 1, 1946, chain and staff gages at old timber bridge 20 ft upstream at present datum.

Average discharge.--28 years, 208 cfs.

Extremes.--Maximum discharge during year, 3,070 cfs July 16 (gage height, 9.76 ft); minimum 33 cfs Oct. 7, Feb. 27-29; minimum gage height, 3.88 ft Oct. 7.
1912-15, 1943-68: Maximum discharge, 4,630 cfs Apr. 24, 1960 (gage height, 11.63 ft); minimum, 4.6 cfs Oct. 8, 1948 (gage height, 3.47 ft).

Remarks.--Records good except those for winter months, which are fair.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	46	716	154	88	54	35	1.190	308	361	308	410	189
2	44	711	149	84	54	35	905	273	334	282	337	392
3	42	698	145	78	54	35	729	250	296	261	267	424
4	40	630	139	72	54	35	666	253	259	229	221	554
5	38	536	133	68	54	36	603	242	223	199	189	1.510
6	36	456	137	64	54	36	562	221	296	171	165	1.120
7	36	413	139	60	56	36	528	201	343	145	145	932
8	125	376	141	54	56	37	540	185	358	129	131	840
9	264	376	137	52	56	38	585	176	373	118	121	1.580
10	293	379	127	50	56	40	576	171	334	105	114	1.870
11	290	428	125	49	54	43	520	160	361	99	94	1.670
12	259	508	127	48	52	46	476	149	484	99	86	1.190
13	264	524	125	47	52	50	504	137	472	101	81	801
14	328	468	125	47	50	55	616	129	428	167	74	612
15	334	379	120	46	50	60	765	131	376	467	66	468
16	319	373	107	47	48	70	747	167	313	2.410	64	385
17	293	340	109	47	46	90	657	313	276	1.910	60	319
18	290	316	111	48	44	358	562	308	245	1.810	56	276
19	340	287	104	48	42	626	492	261	234	1.130	54	245
20	346	276	101	48	40	626	440	247	206	724	74	223
21	392	276	149	48	36	488	468	229	234	536	75	211
22	382	242	170	48	35	400	456	206	316	416	99	191
23	340	231	150	48	35	350	452	358	413	343	156	189
24	512	221	130	48	35	310	492	528	392	293	194	223
25	992	208	120	49	35	293	488	464	343	250	201	234
26	1.120	185	110	49	34	337	460	396	310	239	194	218
27	1.010	170	105	50	33	562	468	402	355	598	178	206
28	778	160	100	50	33	1.030	424	480	396	652	145	189
29	639	154	96	52	33	1.490	385	516	352	528	121	174
30	720	150	92	52	------	1.590	346	480	310	428	104	158
31	734	------	90	54	------	1.420	------	410	------	456	91	------
TOTAL	11.646	11.187	3.867	1.693	1.335	10.657	17.102	8.751	9.993	15.603	4.367	17.593
MEAN	376	373	125	54.6	46.0	344	570	282	333	503	141	586
MAX	1,120	716	170	88	56	1,590	1,190	528	484	2,410	410	1,870
MIN	36	150	90	46	33	35	346	129	206	99	54	158
CFSM	2.20	2.18	.731	.319	.269	2.01	3.33	1.65	1.95	2.94	.825	3.43
IN.	2.54	2.43	.84	.37	.29	2.32	3.72	1.90	2.18	3.39	.95	3.83

CAL YR 1967	TOTAL 102,730	MEAN 281	MAX 2,260	MIN 31	CFSM 1.64	IN 22.32
WTR YR 1968	TOTAL 113,794	MEAN 311	MAX 2,410	MIN 33	CFSM 1.82	IN 24.76

4-0415. Sturgeon River near Alston, Mich.

Location.--Lat 46°43'35", long 88°39'43", in SE 1/4 sec.15, T.50 N., R.35 W., on right bank in powerhouse of Upper Peninsula Power Co. at Prickett Dam, 4 miles upstream from Clear Creek, 5 miles southeast of Alston, and at mile 45.

Drainage area.--346 sq mi.

Records available.--February 1932 to June 1941, October 1942 to September 1968. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Digital water-stage recorder. Datum of gage is 710.3 ft above mean tide at New York City (levels by Corps of Engineers). Prior to Oct. 1, 1963, at datum 40.00 ft lower. Prior to June 30, 1964, graphic water-stage recorder at present site and datum.

Average discharge.--34 years (1932-40, 1942-68), 417 cfs.

Extremes.--Maximum discharge during year, 6,200 cfs July 16 (gage height, 11.64 ft); minimum, 5.4 cfs Nov. 23, 24 (gage height, 2.68 ft); minimum daily, 11 cfs May 12.
1932-41, 1942-68: Maximum discharge, 7,360 cfs Apr. 24, 1960 (gage height, 53.09 ft, datum then in use); minimum daily, 1 cfs Aug. 14-19, 1960.

Remarks.--Records good except those below 15 cfs, which are fair. Flow regulated by powerplant at station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14	1,170	372	17	208	211	1,440	605	752	611	785	179
2	258	1,060	369	280	193	78	1,150	611	609	612	613	508
3	259	1,220	17	278	207	16	1,020	610	612	610	614	590
4	259	1,030	421	268	15	210	1,090	610	609	607	614	933
5	209	801	414	279	193	244	969	201	598	596	602	2,620
6	205	892	381	131	297	316	712	422	447	436	356	1,870
7	14	672	411	20	207	305	589	603	609	364	351	1,500
8	211	617	410	244	190	409	843	578	576	266	346	1,540
9	409	729	404	264	204	410	1,000	391	611	334	257	2,780
10	596	729	16	217	137	407	890	398	608	284	204	3,010
11	595	681	384	218	15	409	593	352	610	231	15	2,620
12	587	828	367	197	235	407	688	11	877	221	222	1,920
13	581	829	370	123	235	418	854	354	1,040	221	229	1,550
14	574	826	317	20	236	229	1,040	300	990	220	285	974
15	569	711	293	218	356	206	1,180	300	703	575	229	921
16	403	577	121	200	274	229	1,100	344	609	3,740	228	759
17	329	614	15	217	200	228	1,230	360	603	2,580	275	588
18	327	748	369	395	17	385	861	402	605	3,300	34	603
19	401	674	367	403	210	717	605	401	592	2,050	209	546
20	582	608	321	212	197	1,070	818	430	434	1,290	228	595
21	677	580	319	17	214	838	816	436	448	1,070	312	592
22	594	371	323	200	196	590	706	433	580	852	406	590
23	580	378	321	210	208	590	778	439	425	616	415	585
24	557	408	256	211	78	590	909	915	657	615	368	579
25	1,980	416	17	195	18	589	965	952	665	613	244	577
26	1,640	430	303	209	225	755	786	650	615	612	289	552
27	1,580	451	305	191	201	921	644	737	734	616	393	404
28	1,450	411	319	15	212	1,390	817	914	793	1,180	411	306
29	862	345	244	203	194	1,840	668	1,040	779	969	416	478
30	1,190	351	261	209	------	2,020	605	849	693	703	234	409
31	1,260	------	16	192	------	2,010	------	753	------	726	225	------
TOTAL	19,752	20,157	8,823	6,053	5,372	19,037	26,366	16,401	19,483	27,720	10,409	31,678
MEAN	637	672	285	195	185	614	879	529	649	894	336	1,056
MAX	1,980	1,220	421	403	356	2,020	1,440	1,040	1,040	3,740	785	3,010
MIN	14	345	15	15	15	16	589	11	425	220	15	179
CFSM	1.84	1.94	.82	.56	.54	1.77	2.54	1.53	1.88	2.58	.97	3.05
IN.	2.12	2.17	.95	.65	.58	2.05	2.83	1.76	2.09	2.98	1.12	3.40

CAL YR 1967 TOTAL 194,164 MEAN 532 MAX 3,580 MIN 11 CFSM 1.54 IN 20.87
WTR YR 1968 TOTAL 211,251 MEAN 577 MAX 3,740 MIN 11 CFSM 1.67 IN 22.71

4-0425. Otter River near Elo, Mich.

Location.--Lat 46°50'09", long 88°38'12", in NE 1/4 NE 1/4 sec.8, T.51 N., R.34 W., 50 ft upstream from highway bridge, 1.6 miles north of Pelkie, 2.5 miles south of Elo, and 5.5 miles upstream from Otter Lake.

Drainage area.--162 sq mi.

Records available.--October 1942 to September 1968. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Digital water-stage recorder. Altitude of gage is 630 ft (from topographic map). Prior to Nov. 1, 1962, at site 2.5 miles downstream at datum 617.88 ft above mean sea level. Nov. 1, 1962, to Nov. 7, 1965, wire-weight gage at site 50 feet downstream at present datum.

Average discharge.--26 years, 214 cfs.

Extremes.--Maximum discharge during year, 2,270 cfs Mar. 19 (gage height, 7.74 ft); minimum, 78 cfs Oct. 5, 6 (gage height, 1.29 ft).

1942-68: Maximum discharge, 4,540 cfs Apr. 19, 1952 (gage height, 13.52 ft, site and datum then in use); minimum observed, 68 cfs Nov. 18, 1947 (discharge measurement, site then in use).

Remarks.--Records good except those for winter months, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	81	360	190	110	110	96	1,060	243	354	129	215	553
2	81	347	190	110	110	96	814	222	355	121	145	597
3	80	311	180	110	110	98	640	218	247	113	118	361
4	80	271	160	110	105	100	837	231	192	130	107	502
5	79	243	150	110	105	105	714	207	161	128	102	1,280
6	80	220	140	110	105	110	626	191	275	112	99	657
7	82	200	147	110	105	120	722	178	338	106	98	510
8	132	186	164	110	105	125	1,070	172	304	104	97	615
9	163	232	155	110	105	130	1,260	170	295	107	98	1,580
10	198	264	149	110	105	135	1,030	165	218	105	99	1,440
11	186	267	145	110	110	130	717	157	422	103	95	652
12	147	330	142	110	110	125	760	152	771	104	93	411
13	130	311	133	110	115	120	793	146	467	106	94	295
14	133	270	132	110	115	120	694	146	329	128	91	236
15	121	243	150	110	115	130	884	168	261	131	90	196
16	111	262	160	115	115	200	624	177	206	494	94	165
17	105	210	165	115	115	420	568	191	176	293	94	149
18	123	259	166	115	110	700	507	172	156	435	91	141
19	140	267	150	120	110	1,680	400	157	143	247	91	135
20	126	211	150	120	110	1,630	346	150	130	165	119	130
21	193	203	160	120	110	889	407	143	147	214	105	127
22	173	176	150	120	105	598	364	138	174	181	243	122
23	144	166	140	120	105	508	317	150	170	130	263	181
24	141	160	135	120	105	453	516	252	163	121	246	198
25	850	155	130	120	100	367	521	204	142	113	156	167
26	1,230	153	125	120	100	391	432	166	130	111	129	173
27	639	137	120	120	98	600	449	396	145	136	113	151
28	413	130	115	115	98	1,080	377	524	156	117	104	136
29	317	160	110	115	96	1,910	324	500	133	105	99	128
30	430	180	110	110	------	1,730	281	341	126	103	95	121
31	417	------	110	110	------	1,470	------	254	------	274	91	------
TOTAL	7,325	6,884	4,523	3,525	3,107	16,366	19,054	6,681	7,286	4,966	3,774	12,109
MEAN	236	229	146	114	107	528	635	216	243	160	122	404
MAX	1,230	360	190	120	115	1,910	1,260	524	771	494	263	1,580
MIN	79	130	110	110	96	96	281	138	126	103	90	121
CFSM	1.46	1.42	.90	.70	.66	3.26	3.92	1.33	1.50	.99	.75	2.49
IN.	1.68	1.58	1.04	.81	.71	3.76	4.37	1.53	1.67	1.14	.87	2.78

CAL YR 1967	TOTAL 78,522	MEAN 215	MAX 2,420	MIN 74	CFSM 1.33	IN 18.03
WTR YR 1968	TOTAL 95,600	MEAN 261	MAX 1,910	MIN 79	CFSM 1.61	IN 21.95

PEAK DISCHARGE (BASE, 1,300 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
10-26	0200	6.04	1,520	03-29	0600	7.17	2,040
03-19	1800	7.74	2,270	09-05	0800	5.93	1,490
				09-09	1900	7.37	2,110

4-0430. Sturgeon River near Arnheim, Mich.

Location.--Lat 46°55'42", long 88°33'23", in NE¼SE¼ sec.1, T.52 N., R.34 W., on right bank 0.2 mile downstream from Otter Lake, 3½ miles west of Arnheim, 8½ miles northeast of Pelkie, and at mile 11.

Drainage area.--705 sq mi.

Records available.--October 1942 to September 1968. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Chain gage or staff gage read once daily. Datum of gage is 605.98 ft above mean tide at New York City (Corps of Engineers bench mark). Prior to July 18, 1967, staff gage read once daily.

Average discharge.--26 years, 807 cfs.

Extremes.--Maximum discharge during year, 4,460 cfs Sept. 11 (gage height, 10.87 ft); minimum, 258 cfs Oct. 2 (gage height, 0.44 ft). 1942-68: Maximum discharge, 15,500 cfs Apr. 20, 1952 (gage height, 14.57 ft, from graph based on gage readings); minimum, 157 cfs July 30, 31, 1963 (gage height, 0.20 ft).

Remarks.--Records good except those for winter months, which are fair. Occasional slight regulation caused by Prickett Dam at mile 45.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	308	2.070	959	520	390	380	3.830	1.190	1.450	1.040	1.110	517
2	258	1.960	899	480	400	410	3.340	1.100	1.450	959	1.130	935
3	271	1.880	857	460	400	380	2.710	1.050	1.350	905	1.010	1.730
4	331	1.830	718	480	390	360	2.390	1.020	1.190	863	917	1.790
5	355	1.740	637	500	370	335	2.320	995	1.160	851	857	1.910
6	370	1.490	642	520	350	385	2.210	875	1.010	845	827	2.740
7	365	1.420	684	520	400	430	1.960	735	1.000	746	695	3.060
8	340	1.390	723	460	420	475	1.870	797	1.120	663	652	2.960
9	385	1.130	735	440	420	522	2.110	839	1.140	621	569	3.110
10	455	1.140	723	460	460	548	2.330	757	1.190	600	559	3.860
11	626	1.210	611	480	450	647	2.270	723	1.250	564	475	4.410
12	740	1.190	626	480	400	690	1.910	690	1.610	491	415	4.270
13	779	1.280	621	470	370	684	1.770	579	1.930	440	340	3.740
14	791	1.340	605	460	440	673	1.770	501	1.940	440	350	3.040
15	797	1.330	585	420	470	642	1.970	684	1.800	435	385	2.310
16	791	1.120	527	380	480	569	2.180	569	1.520	800	390	1.810
17	746	1.080	507	400	470	548	2.070	611	1.800	1.810	375	1.410
18	637	1.090	440	410	450	647	2.070	631	1.130	3.040	390	1.250
19	579	1.140	486	440	420	1.160	1.880	647	1.030	3.510	370	1.100
20	564	1.170	517	460	370	2.310	1.520	647	929	3.480	326	1.080
21	631	1.130	595	480	380	2.810	1.450	647	845	2.860	380	935
22	791	1.040	621	420	400	2.910	1.450	652	803	2.250	512	815
23	821	917	679	400	400	2.490	1.380	647	887	1.790	605	905
24	797	833	668	400	410	2.170	1.360	701	869	1.340	723	962
25	980	779	670	400	400	1.800	1.590	935	887	1.190	785	1.010
26	2.090	768	660	400	350	1.700	1.710	1.100	929	1.060	746	1.000
27	2.660	684	600	400	310	1.800	1.660	1.120	905	983	600	971
28	2.630	757	600	410	350	2.150	1.470	1.300	941	983	553	905
29	2.440	965	620	380	360	3.080	1.450	1.590	1.030	1.110	559	757
30	2.030	977	630	350	------	3.800	1.320	1.750	1.040	1.120	564	735
31	2.030	------	580	350	------	3.980	------	1.670	------	1.080	522	------
TOTAL	28.388	36.850	20.025	13.630	11.680	41.485	59.320	27.752	36.135	38.869	18.691	56.027
MEAN	916	1,228	646	440	403	1,338	1,977	895	1,204	1,254	603	1,868
MAX	2,660	2,070	959	520	480	3,980	3,830	1,750	1,940	3,510	1,130	4,410
MIN	258	684	440	350	310	335	1,320	501	803	435	326	517
CFSM	1.30	1.74	.916	.624	.572	1.90	2.80	1.27	1.71	1.78	.855	2.65
IN.	1.50	1.94	1.06	.72	.62	2.19	3.12	1.46	1.91	2.05	.99	2.96

CAL YR 1967	TOTAL 337,799	MEAN 925	MAX 5,100	MIN 257	CFSM 1.31	IN 17.81
WTR YR 1968	TOTAL 388,852	MEAN 1,062	MAX 4,410	MIN 258	CFSM 1.51	IN 20.52

4-0430.5. Trap Rock River near Lake Linden, Mich.

Location.--Lat 47°13'43", long 88°23'07", in SE¼ SE¼ sec.20, T.56 N., R.32 W., on right bank, 20 ft upstream from bridge on county highway, 2 miles northeast of Lake Linden, and 3 miles upstream from mouth.

Drainage area.--28.0 sq mi.

Records available.--October 1966 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 621.7 ft above mean sea level, datum of 1929.

Extremes.--Maximum discharge during year, 865 cfs June 11 (gage height, 8.35 ft); minimum, 8.9 cfs Oct. 1, (gage height, 3.90 ft). 1967-68: Maximum discharge, that of June 11, 1968; minimum, 8.0 cfs Sept. 9, 10, 1967 (gage height, 3.88 ft).

Remarks.--Records fair. Some ground water pumped from mines at headwaters. Small diversions for sprinkler irrigation.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.2	49	24	21	18	13	136	50	62	30	49	198
2	9.2	43	24	22	16	13	111	44	63	27	35	158
3	9.5	40	25	22	16	14	111	53	47	25	27	88
4	9.5	40	24	23	16	14	136	67	38	46	24	144
5	9.2	39	25	23	16	15	136	49	60	41	22	407
6	9.2	35	25	23	16	16	108	43	296	31	20	136
7	9.5	33	39	23	16	17	151	37	459	25	19	168
8	18	34	40	22	16	18	311	35	182	23	18	272
9	27	55	35	22	17	21	328	35	108	21	18	311
10	43	59	30	21	18	25	208	33	114	20	18	141
11	38	63	28	20	18	25	160	30	458	19	16	85
12	27	58	27	20	20	25	205	28	477	20	16	60
13	24	47	25	20	20	25	193	26	162	24	16	47
14	28	40	24	20	20	23	200	28	169	66	14	43
15	24	39	22	20	21	23	205	31	117	49	14	36
16	20	52	21	20	20	26	125	42	81	42	16	32
17	18	51	21	20	19	36	119	70	61	108	15	29
18	22	50	24	21	18	57	102	49	53	520	14	27
19	24	40	29	21	17	130	77	39	51	129	18	27
20	22	39	31	21	17	196	68	35	43	68	23	27
21	22	31	35	21	16	147	102	32	41	185	23	25
22	20	30	32	21	15	117	88	28	45	92	36	24
23	18	29	28	20	14	120	71	33	56	56	48	50
24	19	28	26	19	13	91	88	40	56	47	58	47
25	226	28	24	19	13	70	81	32	44	39	41	43
26	211	27	23	19	12	81	80	28	35	33	32	38
27	87	27	22	18	12	132	96	103	35	32	25	32
28	58	27	22	18	13	349	83	127	35	27	21	29
29	48	26	21	18	13	490	68	95	32	24	18	27
30	74	25	20	18	------	320	59	66	30	28	16	24
31	61	------	21	18	------	205	------	49	------	70	18	------
TOTAL	1,244.3	1,184	817	634	476	2,854	4,006	1,457	3,510	1,967	748	2,775
MEAN	40.1	39.5	26.4	20.5	16.4	92.1	134	47.0	11.7	63.5	24.1	92.5
MAX	226	63	40	23	21	490	328	127	477	520	58	407
MIN	9.2	25	20	18	12	13	59	26	30	19	14	24
CFSM	1.43	1.41	.943	.732	.586	3.29	4.79	1.68	4.18	2.27	.861	3.30
IN.	1.65	1.57	1.09	.84	.63	3.79	5.34	1.94	4.66	2.62	.99	3.68

CAL YR 1967	TOTAL 14,911.1	MEAN 40.9	MAX 625	MIN 8.3	CFSM 1.46	IN 19.82
WTR YR 1968	TOTAL 21,672.3	MEAN 59.2	MAX 520	MIN 9.2	CFSM 2.11	IN 28.80

PEAK DISCHARGE (BASE, 250 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
10-25	2100	6.14	392	06-11	2100	8.35	865
03-28	2000	6.97	535	07-18	1100	7.86	682
04-09	0300	6.10	376	07-21	0900	5.86	308
04-13	0200	5.67	260	09-01	2200	6.05	358
04-15	0100	5.79	302	09-05	0400	7.18	569
06-07	0800	7.07	615	09-07	2400	6.06	360
				09-09	0400	6.07	362

4-0444. Carp River near Negaunee, Mich.

Location.--Lat 46°31'29", long 87°34'25", in SE1/4 sec.29, T.48 N., R.26 W., on right bank 30 ft downstream from bridge on U. S. Highway 41 and 2 miles northeast of Negaunee.

Drainage area.--51.4 sq mi.

Records available.--July 1961 to September 1968.

Gage.--Digital water-stage recorder. Altitude of gage is 1,320 ft (from topographic map). Prior to Aug. 24, 1961, wire-weight gage on downstream side of bridge at present datum. Aug. 24, 1961, to Sept. 29, 1966, graphic water-stage recorder at present site and datum.

Average discharge.--7 years, 51.4 cfs.

Extremes.--Maximum discharge during year, 351 cfs June 27, 28 (gage height, 4.68 ft); minimum, 8.5 cfs Aug. 2 (gage height, 2.13 ft).

1961-68: Maximum discharge, that of June 27, 28, 1968; minimum, 3.7 cfs July 29, 1965; minimum gage height, 1.94 ft Aug. 1, 1962.

Remarks.--Records good except those for winter months, which are poor. Flow regulated by Deer Lake storage reservoir (capacity 22,500 acre-feet) 5 miles above station. Some ground water is pumped from mines into basin above station and the city of Ishpeming diverts a small amount of water into basin as waste effluent. Records of chemical analyses for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	37	47	44	37	38	80	61	65	56	102	82	82
2	36	49	45	37	38	80	84	64	74	84	81	101
3	35	50	43	37	38	80	78	65	69	77	80	91
4	35	47	43	37	38	78	83	69	63	73	79	80
5	35	44	43	37	38	78	90	65	62	71	80	93
6	35	43	43	37	39	76	75	63	118	69	81	93
7	36	43	43	37	39	74	76	61	240	67	80	84
8	62	44	43	37	39	73	89	61	126	66	80	87
9	61	45	42	37	39	73	87	61	88	65	73	171
10	52	48	43	37	39	71	79	61	82	65	55	182
11	53	49	42	37	39	70	74	60	108	65	45	118
12	47	48	41	37	39	86	75	59	115	65	41	91
13	46	44	40	37	39	79	85	59	91	66	39	81
14	46	44	40	37	39	77	91	59	82	73	38	77
15	51	45	41	37	39	83	96	60	77	69	25	75
16	51	41	43	37	39	134	80	79	72	69	13	72
17	43	44	42	37	39	140	75	100	73	66	12	72
18	49	44	41	37	39	143	73	78	73	67	10	73
19	57	44	36	37	39	107	71	66	73	66	9.3	73
20	47	54	38	37	39	49	77	63	69	64	9.2	88
21	44	48	38	37	39	45	96	62	81	62	9.5	84
22	42	45	38	37	39	113	85	61	110	61	11	77
23	40	44	38	37	45	90	78	72	89	65	15	79
24	45	43	37	37	55	82	84	74	89	80	23	95
25	94	43	37	38	70	82	83	66	79	82	15	88
26	68	43	37	38	75	91	77	63	75	82	11	80
27	51	40	37	38	80	107	78	77	207	90	32	76
28	45	45	37	38	80	152	72	93	280	87	60	75
29	44	46	37	38	80	118	69	86	134	84	68	74
30	55	43	37	38	------	83	66	73	102	83	68	73
31	52	------	37	38	------	75	------	67	------	83	68	------
TOTAL	1,494	1,357	1,246	1,154	1,338	2,769	2,387	2,112	3,067	2,268	1,393.0	2,685
MEAN	48.2	45.2	40.2	37.2	46.1	89.3	79.6	68.1	102	73.2	44.9	89.5
MAX	94	54	45	38	80	152	96	100	280	102	82	182
MIN	35	40	36	37	38	45	61	59	62	61	9.2	72

CAL YR 1967 TOTAL 20,689.3 MEAN 56.7 MAX 151 MIN 8.0
WTR YR 1968 TOTAL 23,270.0 MEAN 63.6 MAX 280 MIN 9.2

4-0445.83 Cherry Creek near Harvey, Mich.

Location.--Lat 46°28'07", long 87°21'53", in NE¼ SE¼ sec. 13, T.47 N., R.25 W., on left bank, 0.5 mile above county highway 551, 2 miles south of Harvey.

Drainage area.--4.53 sq mi.

Records available.--October 1965 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 670 ft (from topographic map).

Extremes.--Maximum discharge during year, 30 cfs June 7 (gage height, 3.78 ft); maximum gage height, 3.95 ft July 21 (beaver activity); minimum daily discharge, 18 cfs on several days; minimum gage height, 2.47 ft Sept. 30 (weir plate removed).
1966-68: Maximum discharge, that of June 7, 1968; maximum gage height, that of July 21, 1968; minimum discharge, 16 cfs Jan. 25, 1967; minimum gage height, that of Sept. 30, 1968.

Remarks.--Records good.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	19	20	19	19	19	19	19	19	19	19	18	20
2	19	20	19	19	19	19	19	19	19	19	19	19
3	19	19	19	19	19	19	19	19	19	19	18	18
4	19	19	19	19	19	19	19	19	19	19	18	18
5	19	19	19	19	19	19	19	19	19	19	18	19
6	19	19	19	19	19	19	19	19	20	19	18	18
7	19	19	19	19	19	19	19	19	22	19	18	18
8	21	19	19	19	19	19	19	19	20	19	19	19
9	19	19	19	19	19	19	19	19	19	19	18	20
10	20	19	19	19	19	19	19	19	19	19	18	19
11	19	19	19	19	19	19	19	19	19	19	18	19
12	19	19	19	19	19	19	19	19	19	19	18	19
13	19	19	19	19	19	19	19	19	19	19	18	19
14	19	19	19	19	19	19	19	19	19	19	18	19
15	20	19	19	19	19	19	19	19	19	19	18	19
16	19	19	19	19	19	19	19	20	19	19	18	19
17	19	19	19	19	19	19	19	19	19	19	19	19
18	20	19	19	19	19	20	19	19	19	19	18	19
19	19	19	19	19	19	20	19	19	19	19	19	19
20	19	19	19	19	19	19	19	19	19	19	19	19
21	19	19	19	19	19	19	19	19	20	19	19	19
22	19	19	19	19	19	19	19	19	19	19	19	19
23	19	19	19	19	19	19	19	19	20	19	19	19
24	21	19	19	19	19	19	19	19	20	19	19	19
25	21	19	19	19	19	19	19	19	19	19	19	19
26	20	19	19	19	19	19	19	19	19	19	19	19
27	20	19	19	19	19	19	19	20	22	19	18	19
28	20	19	19	19	19	20	19	20	20	19	18	19
29	20	19	19	20	19	19	19	19	20	19	18	19
30	20	19	19	19	------	19	19	19	20	19	18	19
31	20	------	19	19	------	19	------	19	------	19	18	------
TOTAL	604	572	589	590	551	592	570	592	584	589	568	568
MEAN	19.5	19.1	19.0	19.0	19.0	19.1	19.0	19.1	19.5	19.0	18.3	18.9
MAX	21	20	19	20	19	20	19	20	22	19	19	20
MIN	19	19	19	19	19	19	19	19	19	19	18	18
CFSM	4.30	4.21	4.19	4.20	4.19	4.22	4.19	4.22	4.30	4.19	4.04	4.18
IN.	4.96	4.70	4.84	4.84	4.52	4.86	4.68	4.86	4.79	4.84	4.66	4.66

CAL YR 1967: TOTAL 6,787 MEAN 18.6 MAX 21 MIN 17 CFSM 4.10 IN 55.72
WAT YR 1968: TOTAL 6,969 MEAN 19.0 MAX 22 MIN 18 CFSM 4.20 IN 57.21

GPO 817-436-4

4-0455. Tahquamenon River near Tahquamenon Paradise, Mich.

Location.--Lat 46°34'30", long 85°16'10", in NE¼ sec.11, T.48 N., R.8 W., on left bank 0.7 mile upstream from Tahquamenon (Big) Falls, 11.5 miles west of Tahquamenon Paradise, and 19 miles northeast of Newberry.

Drainage area.--790 sq mi.

Records available.--August 1953 to September 1968.

Gage.--Digital water-stage recorder. Altitude of gage is 697 ft (from river-profile map). Prior to June 18, 1968, graphic water-stage recorder at same site and datum.

Average discharge.--15 years, 870 cfs.

Extremes.--Maximum discharge during year, 4,260 cfs Apr. 8 (gage height, 8.39 ft); minimum, 245 cfs Aug. 3 (gage height, 3.16 ft). 1953-68: Maximum discharge, 6,990 cfs May 10, 1960 (gage height, 10.26 ft); minimum, 157 cfs July 26, 1955 (gage height, 2.88 ft); minimum gage-height, 2.86 ft July 7, 1963.

Remarks.--Records good.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	323	877	580	588	418	430	3,710	2,250	904	1,510	272	763
2	320	988	554	548	464	430	3,870	2,110	946	1,490	281	685
3	314	1,140	552	502	479	425	3,920	1,930	1,000	1,490	263	622
4	317	1,220	536	475	479	425	4,050	1,770	1,060	1,420	257	580
5	308	1,280	525	453	483	425	4,150	1,620	1,020	1,340	257	603
6	311	1,300	517	434	491	425	4,190	1,490	1,000	1,260	254	684
7	305	1,280	529	422	498	430	4,110	1,350	934	1,140	281	774
8	337	1,270	532	411	498	440	4,200	1,220	882	1,020	305	852
9	407	1,250	513	403	494	450	4,200	1,080	795	866	314	920
10	460	1,230	494	388	494	455	4,150	970	732	765	308	989
11	487	1,230	494	388	494	465	4,090	866	674	669	299	1,080
12	506	1,190	506	388	487	475	4,000	775	596	576	290	1,110
13	513	1,200	529	378	487	485	3,910	705	564	506	275	1,100
14	532	1,170	536	378	479	495	3,890	648	521	449	266	1,060
15	556	1,160	532	374	475	506	3,970	660	494	403	302	974
16	580	1,110	521	368	475	513	3,960	770	479	364	275	914
17	608	1,070	513	361	470	532	3,860	1,010	456	337	281	835
18	592	1,010	517	361	465	568	3,750	1,140	460	317	317	754
19	596	964	552	361	460	687	3,620	1,190	475	302	354	723
20	604	922	568	361	455	855	3,450	1,190	502	305	353	714
21	596	877	592	364	450	946	3,290	1,180	517	308	372	703
22	612	844	714	368	450	1,000	3,150	1,140	678	311	450	691
23	604	811	775	371	450	1,050	2,990	1,050	894	330	642	684
24	588	790	811	374	445	1,090	2,970	940	1,080	317	873	689
25	620	770	833	371	440	1,150	2,950	844	1,170	311	1,010	711
26	636	765	822	364	440	1,240	2,930	741	1,180	305	1,120	715
27	674	718	800	361	440	1,380	2,850	678	1,230	290	1,170	705
28	705	612	765	364	440	1,670	2,770	723	1,350	284	1,160	686
29	714	596	718	374	435	2,150	2,630	795	1,410	278	1,090	664
30	732	588	718	388	------	2,740	2,420	844	1,440	284	986	642
31	806	------	628	399	------	3,320	------	882	------	266	875	------
TOTAL	16,263	30,232	18,786	12,440	13,535	27,652	108,000	34,561	25,443	19,813	15,552	23,626
MEAN	525	1,008	606	401	467	892	3,600	1,115	848	639	502	788
MAX	806	1,300	833	588	498	3,320	4,200	2,250	1,440	1,510	1,170	1,110
MIN	305	588	494	361	418	425	2,420	648	456	266	254	580
CFSM	.66	1.28	.77	.51	.59	1.13	4.56	1.41	1.07	.81	.64	1.00
IN.	.77	1.43	.88	.59	.64	1.30	5.09	1.63	1.19	.93	.73	1.11

CAL YR 1967:	TOTAL	335,427	MEAN	919	MAX	4,710	MIN	257	CFSM	1.16	IN	15.79
WTR YR 1968:	TOTAL	345,903	MEAN	945	MAX	4,200	MIN	254	CFSM	1.20	IN	16.26

4-0460. Black River near Garnet, Mich.

Location.--Lat 46°07'05", long 85°21'55", in SE 1/4 sec.13, T.43 N., R.9 W., on right bank 10 ft upstream from highway bridge, 15 ft downstream from Peters Creek entering from right, 3 1/2 miles upstream from Lake Michigan, and 4 miles southwest of Garnet.

Drainage area.--28 sq mi, approximately.

Records available.--September 1951 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 629.7 ft above mean sea level, datum of 1929.

Average discharge.--17 years, 26.5 cfs.

Extremes.--Maximum discharge during year, 195 cfs Apr. 4 (gage height, 4.64 ft); minimum, 8.7 cfs Oct. 5-7 (gage height, 2.34 ft).

1951-68: Maximum discharge, 860 cfs May 7, 1960 (gage height, 8.55 ft), from rating curve extended above 400 cfs by logrithmic plotting; minimum, 4.9 cfs Mar. 11, 1956 (gage height, 2.10 ft).

Remarks.--Records fair. Records of water temperatures for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	9.5	29	18	18	16	11	119	49	40	74	13	14
2	9.2	49	19	17	18	11	101	43	53	57	12	14
3	9.2	47	20	16	20	10	94	39	49	45	12	13
4	8.9	42	18	16	17	11	174	36	41	38	12	15
5	8.9	37	17	16	16	11	146	33	36	38	12	24
6	8.9	33	17	15	16	10	111	30	29	31	12	25
7	8.9	29	19	15	15	10	98	28	26	27	12	29
8	14	26	18	15	14	11	108	28	23	24	14	33
9	14	28	17	14	14	11	104	29	22	26	13	43
10	12	27	17	13	14	12	93	28	20	23	12	42
11	12	43	17	13	14	11	82	25	20	20	12	35
12	12	50	18	13	13	12	74	23	23	18	12	28
13	13	46	18	13	13	11	75	22	18	18	12	24
14	16	40	17	12	13	11	94	22	18	16	12	22
15	16	34	16	12	13	11	117	36	18	16	11	20
16	16	30	16	12	12	11	104	45	17	15	13	18
17	16	29	16	12	12	12	90	54	16	15	14	17
18	15	29	19	12	12	15	85	44	16	15	12	20
19	14	28	22	12	12	33	74	37	17	15	14	24
20	14	26	21	12	12	41	70	33	16	14	15	31
21	14	25	28	12	12	37	82	29	23	16	13	26
22	13	25	39	12	11	36	74	25	50	17	22	23
23	13	24	37	12	11	38	74	23	46	14	43	21
24	13	25	34	12	11	38	114	21	40	14	36	22
25	16	26	30	12	11	41	107	20	33	13	27	23
26	17	25	28	12	11	47	93	19	29	13	23	20
27	16	23	26	12	11	62	79	33	50	13	19	20
28	16	21	25	12	11	129	67	69	63	12	17	19
29	15	19	23	13	11	172	60	56	54	12	16	18
30	22	18	21	14	------	149	55	50	66	12	15	18
31	31	------	19	14	------	145	------	40	------	14	14	------
TOTAL	433.5	933	670	415	386	1,170	2,818	1,069	972	695	496	701
MEAN	14.0	31.1	21.6	13.4	13.3	37.7	93.9	34.5	32.4	22.4	16.0	23.4
MAX	31	50	39	18	20	172	174	69	66	74	43	43
MIN	8.9	18	16	12	11	10	55	19	16	12	11	13
CFSM	.50	1.11	.77	.48	.48	1.35	3.35	1.23	1.16	.80	.57	.83
IN.	.58	1.24	.89	.55	.51	1.55	3.74	1.42	1.29	.92	.66	.93

CAL YR 1967: TOTAL 11,578.9 MEAN 31.7 MAX 315 MIN 8.1 CFSM 1.13 IN 15.38
WAT YR 1968: TOTAL 10,758.5 MEAN 29.4 MAX 174 MIN 8.9 CFSM 1.05 IN 14.29

PEAK DISCHARGE (BASE, 120 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
03-29	0300	4.54	181	04-04	1700	4.64	195

4-0495. Manistique River at Germfask, Mich.

Location.—Lat 46°14'00", long 85°55'40", in SE¼ sec.4,T.44 N., R.13 W., on left bank 600 ft upstream from bridge on State Highway 77, 1 mile south of Germfask, 1½ miles upstream from Grays Creek, and 1 mile 62.5.

Drainage area.—341 sq mi.

Records available.—March 1938 to September 1968.

Gage.—Digital water-stage recorder. Datum of gage is 662.40 ft above mean sea level (levels by Michigan Department of Conservation). Prior to Dec. 29, 1938, staff gage at site 600 ft downstream at different datum. Dec. 29, 1938, to Oct. 18, 1965, graphic water-stage recorder at present site and datum.

Average discharge.—30 years, 442 cfs.

Extremes.—Maximum discharge during year, 1,190 cfs Apr. 1 (gage height, 5.17 ft); maximum gage height, 5.61 ft Jan 6 (ice jam); minimu discharge, 210 cfs Aug. 5 (gage height, 1.19 ft).
1938-68: Maximum discharge, 2,250 cfs May 10, 1960 (gage height, 8.64 ft); minimum, 135 cfs July 25, 26, 1955; minimum gage height, 0.77 ft July 25, 26, 1955, Aug. 10, 11, 27-29, 1963.

Remarks.—Records good except those for winter months or period of no gage-height record, which are fair. Since July 1948, slight regulation on outlet of Manistique Lake, about seven miles upstream.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	316	540	300	460	370	355	1,180	837	496	726	234	254
2	315	570	310	450	375	355	1,140	795	588	688	229	250
3	310	596	350	440	380	360	1,070	760	619	649	221	261
4	300	587	380	435	385	360	1,080	724	585	611	216	269
5	290	579	463	430	395	365	1,070	692	553	566	212	356
6	290	569	414	420	400	365	1,040	667	523	518	215	439
7	290	555	421	410	405	370	1,010	645	491	486	235	464
8	290	537	422	405	410	370	1,000	626	456	469	262	491
9	320	528	420	400	415	370	1,010	609	423	451	257	570
10	360	527	420	395	420	380	1,020	600	401	436	241	660
11	380	536	410	390	420	387	1,020	589	387	423	231	647
12	390	541	400	390	420	380	985	578	376	411	224	617
13	400	534	390	385	420	375	955	567	422	406	220	581
14	410	526	385	380	420	370	985	560	495	402	222	554
15	415	499	384	375	420	370	1,060	575	493	392	226	514
16	420	502	384	375	420	373	1,130	617	481	383	227	474
17	420	482	389	370	415	383	1,160	711	465	372	245	445
18	420	481	412	370	410	400	1,170	706	459	320	265	433
19	420	481	430	370	400	478	1,130	674	478	242	264	439
20	415	480	422	370	400	556	1,070	647	473	240	261	474
21	410	478	429	365	395	543	1,060	615	483	239	257	520
22	405	475	450	365	390	529	1,030	578	572	256	274	516
23	400	471	460	365	385	524	992	578	605	268	342	505
24	400	472	470	365	380	515	1,020	600	605	257	400	517
25	405	469	480	360	370	530	1,040	588	588	247	395	536
26	415	466	490	360	360	564	1,040	562	566	241	382	524
27	430	444	490	360	360	624	1,030	592	619	237	367	516
28	450	411	490	360	355	813	992	687	699	238	338	505
29	470	360	480	365	355	1,020	941	691	678	236	301	485
30	500	310	480	365	------	1,100	886	667	673	228	276	466
31	520	------	470	370	------	1,140	------	593	------	231	260	------
TOTAL	11,976	15,006	13,095	12,020	11,450	15,624	31,316	19,930	15,752	11,869	8,299	14,314
MEAN	386	500	422	388	395	504	1,044	643	525	383	268	477
MAX	520	596	490	460	420	1,140	1,180	837	699	726	400	660
MIN	290	310	300	360	355	355	886	560	376	228	212	254
CFSM	1.13	1.47	1.24	1.14	1.16	1.48	3.06	1.89	1.54	1.12	.79	1.40
IN.	1.31	1.64	1.43	1.31	1.25	1.70	3.42	2.17	1.72	1.29	.91	1.56

CAL YR 1967: TOTAL 177,524 MEAN 485 MAX 1,330 MIN 197 CFSM 1.42 IN 19.36
WTR YR 1968: TOTAL 180,651 MEAN 494 MAX 1,180 MIN 212 CFSM 1.45 IN 19.70

Note.--No gage-height record Oct. 2 to Nov. 2.

4-0550. Manistique River near Blaney, Mich.

Location.--Lat 46°05'05", long 86°03'35", in SE¼ sec.28, T.43 N., R.14 W., on left bank 40 ft downstream from logging bridge, half a mile downstream from Duck Creek, 7 miles southwest of Blaney, and at mile 34.5.

Drainage area.--704 sq mi.

Records available.--March 1938 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 612.55 ft above mean sea level, datum of 1929 (levels by Michigan Department of Conservation). Prior to July 24, 1939, chain gage on downstream side of bridge 40 ft upstream at present datum. July 24, 1939 to Oct. 19, 1965, graphic water-stage recorder at present site and datum.

Average discharge.--30 years, 824 cfs.

Extremes.--Maximum discharge during year, 3,360 cfs Apr. 3 (gage height, 16.73 ft); minimum, 333 cfs Aug. 15 (gage height, 6.73 ft). 1938-68: Maximum discharge, 9,300 cfs Apr. 1, 1938 (gage height, 19.42 ft, from graph based on gage readings); minimum, 182 cfs July 26, 1955.

Remarks.--Records good except those for winter months, which are fair. Since July 1948, slight regulation on outlet of Manistique Lake, about 25 miles upstream.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	390	911	520	720	540	540	3,290	1,880	1,190	1,570	395	399
2	392	951	540	700	550	530	3,350	1,720	1,190	1,610	387	441
3	392	1,040	560	690	550	530	3,280	1,580	1,290	1,550	377	445
4	381	1,060	620	680	550	530	3,190	1,470	1,270	1,470	369	441
5	375	1,080	680	670	560	530	3,110	1,380	1,200	1,360	352	527
6	364	1,080	710	650	570	530	2,930	1,290	1,140	1,220	351	680
7	361	1,070	740	640	580	530	2,750	1,220	1,090	1,100	362	749
8	424	1,030	740	630	580	540	2,630	1,140	1,050	998	383	822
9	596	1,000	740	620	590	540	2,570	1,100	972	931	401	923
10	637	950	740	600	600	540	2,530	1,050	906	868	388	1,060
11	622	950	730	590	600	550	2,450	1,020	864	818	371	1,140
12	611	960	720	580	610	550	2,350	981	834	790	356	1,120
13	633	970	710	570	610	550	2,240	946	791	750	346	1,060
14	665	980	700	560	610	550	2,190	917	803	717	340	995
15	667	1,000	700	560	600	560	2,350	927	851	685	336	930
16	677	940	700	560	600	560	2,560	992	832	651	344	860
17	689	900	710	560	600	580	2,680	1,190	800	624	353	779
18	689	880	730	560	600	620	2,750	1,280	770	600	368	734
19	678	880	750	550	590	660	2,760	1,250	800	524	390	738
20	670	880	760	550	580	800	2,680	1,180	807	459	423	778
21	675	870	760	540	580	1,200	2,600	1,120	823	454	406	853
22	664	860	770	540	570	1,350	2,540	1,060	1,010	476	412	881
23	656	860	770	540	560	1,400	2,440	1,020	1,110	472	480	906
24	642	860	770	530	560	1,500	2,340	1,050	1,120	469	562	994
25	662	850	770	530	540	1,600	2,320	1,030	1,100	450	600	1,010
26	703	830	770	530	540	1,700	2,320	989	1,070	433	580	974
27	733	800	760	530	540	2,000	2,280	987	1,140	425	551	921
28	754	730	760	530	540	2,400	2,210	1,170	1,360	417	512	877
29	744	600	750	530	540	2,590	2,120	1,340	1,420	407	486	841
30	765	540	740	540	------	2,840	2,010	1,340	1,430	396	464	807
31	868	------	730	540	------	3,100	------	1,310	------	396	421	------
TOTAL	18,779	27,282	22,150	18,120	16,640	33,000	77,820	36,029	31,033	24,090	12,866	24,685
MEAN	606	909	715	585	574	1,065	2,594	1,191	1,034	777	415	823
MAX	868	1,080	770	720	610	3,100	3,350	1,880	1,430	1,610	600	1,140
MIN	361	540	520	530	540	530	2,010	917	770	396	336	399
CFSM	.86	1.29	1.01	.83	.82	1.51	3.68	1.69	1.47	1.10	.59	1.17
IN.	.99	1.44	1.17	.96	.88	1.74	4.11	1.95	1.64	1.27	.68	1.30

CAL YR 1967: TOTAL 327,135 MEAN 894 MAX 4,100 MIN 254 CFSM 1.27 IN 17.28
WTR YR 1968: TOTAL 343,394 MEAN 938 MAX 3,350 MIN 336 CFSM 1.33 IN 18.14

4-0565. Manistique River near Manistique, Mich.

Location.--Lat 46°01'50", long 86°09'40", in SE¼ sec.15, T.42 N., R.15 W., on left bank 1 mile downstream from West Branch, 6 miles northeast of Manistique, and at mile 19.5.

Drainage area.--1,100 sq mi, approximately.

Records available.--March 1938 to September 1968.

Gage.--Digital water-stage recorder. Altitude of gage is 608 ft (from river-profile map). Prior to July 15, 1939, chain gage at site 1,600 ft upstream at different datum. July 15, 1939, to June 20, 1968, graphic water-stage recorder at present site and datum.

Average discharge.--30 years, 1,361 cfs.

Extremes.--Maximum discharge during year, 5,720 cfs Apr. 3 (gage height, 10.16 ft); minimum, 505 cfs Oct. 7 (gage height, 2.31 ft). 1938-68: Maximum discharge, 16,900 cfs May 11, 1960 (gage height, 12.85 ft); minimum, 288 cfs Oct. 4, 1948; minimum gage height, 1.01 ft Aug. 23, 1941.

Remarks.--Records good except those for winter months, which are fair. Since July 1948, slight regulation by dam on outlet of Manistique Lake.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	546	1,500	820	1,050	780	760	5,240	3,420	1,910	2,690	740	716
2	549	1,600	820	1,030	790	760	5,630	3,120	1,840	2,810	726	776
3	556	1,710	860	1,020	800	760	5,680	2,820	1,930	2,780	707	821
4	542	1,770	920	1,000	810	760	5,630	2,580	2,010	2,640	684	827
5	532	1,760	1,000	980	820	760	5,480	2,360	1,980	2,450	661	918
6	518	1,720	1,020	960	840	760	5,280	2,120	1,900	2,160	659	1,110
7	509	1,670	1,050	940	860	760	5,040	2,010	1,800	1,890	701	1,260
8	588	1,600	1,050	920	880	770	4,890	1,880	1,710	1,690	720	1,380
9	756	1,540	1,050	900	900	780	4,690	1,780	1,610	1,550	747	1,540
10	874	1,490	1,050	890	900	800	4,540	1,700	1,480	1,430	732	1,720
11	896	1,500	1,040	880	900	810	4,480	1,620	1,400	1,350	697	1,880
12	906	1,520	1,030	870	900	820	4,420	1,560	1,340	1,300	666	1,950
13	920	1,550	1,020	860	900	830	4,300	1,500	1,280	1,240	639	1,950
14	972	1,560	1,010	840	900	820	4,220	1,450	1,260	1,180	623	1,860
15	1,000	1,530	1,000	820	900	810	4,370	1,440	1,300	1,130	604	1,730
16	1,020	1,410	1,020	800	900	820	4,380	1,500	1,300	1,090	607	1,560
17	1,030	1,440	1,060	800	900	840	5,110	1,710	1,260	1,050	637	1,410
18	1,040	1,440	1,100	780	880	900	5,310	1,900	1,220	1,010	641	1,310
19	1,030	1,440	1,120	780	880	1,100	5,340	1,950	1,230	960	681	1,280
20	1,020	1,430	1,150	770	870	1,400	5,210	1,910	1,260	876	772	1,400
21	1,020	1,420	1,180	770	860	1,700	5,140	1,810	1,350	866	770	1,520
22	1,010	1,410	1,200	760	850	2,100	4,980	1,700	1,560	908	787	1,600
23	988	1,410	1,200	760	840	2,300	4,770	1,620	1,770	897	879	1,620
24	968	1,400	1,200	750	830	2,400	4,550	1,590	1,850	879	935	1,720
25	976	1,390	1,180	750	820	2,500	4,440	1,580	1,880	848	998	1,770
26	1,030	1,380	1,150	750	800	2,700	4,310	1,510	1,880	819	1,000	1,710
27	1,140	1,330	1,130	750	780	3,100	4,250	1,490	1,960	805	964	1,610
28	1,220	1,190	1,120	750	770	3,810	4,100	1,640	2,200	789	903	1,510
29	1,260	1,000	1,100	750	760	4,400	3,900	1,860	2,390	768	847	1,430
30	1,330	900	1,090	760	------	4,520	3,680	2,000	2,500	747	810	1,370
31	1,430	------	1,080	770	------	4,970	------	1,990	------	744	756	------
TOTAL	28,176	44,010	32,820	26,210	24,620	51,320	143,360	59,120	50,360	42,346	23,293	43,258
MEAN	909	1,467	1,059	845	849	1,655	4,779	1,907	1,679	1,366	751	1,442
MAX	1,430	1,770	1,200	1,050	900	4,970	5,680	3,420	2,500	2,810	1,000	1,950
MIN	509	900	820	750	760	760	3,680	1,440	1,220	744	604	716
CFSM	.83	1.33	.96	.77	.77	1,50	4.34	1.73	1.53	1.24	.68	1,31
IN.	.95	1.48	1.11	.89	.83	1.73	4.84	1.99	1.71	1.43	.79	1.46

CAL YR 1967:	TOTAL	549,384	MEAN	1,505	MAX	7,630	MIN	390	CFSM	1.37	IN	18.57
WTR YR 1968:	TOTAL	568,893	MEAN	1,554	MAX	5,680	MIN	509	CFSM	1.41	IN	19.21

4-0570. Indian River near Manistique, Mich.

Location.--Lat 45°59'30", long 86°17'15", in NE 1/4 sec.34, T.42 N., R.16 W., on shore of Indian Lake just upstream from highway bridge over outlet of Indian Lake, and 2 miles northwest of Manistique.

Drainage area.--302 sq mi.

Records available.--March 1938 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 608.66 ft above mean sea level (levels by Michigan Department of Natural Resources). Prior to July 9, 1942, chain gage at highway bridge 30 ft downstream at same datum. July 9, 1942, to May 2, 1968, graphic water-stage recorder at present site and datum. Auxiliary digital water-stage recorder on left bank 1 1/2 miles downstream at same datum. From Jan. 18, 1944 to Nov. 9, 1967, staff gage on right bank 1 1/2 miles downstream at same datum, read twice daily.

Average discharge.--30 years, 373 cfs.

Extremes.--Maximum daily discharge during year, 766 cfs Apr. 24; maximum gage height, 5.24 ft Apr. 25; minimum daily discharge, 135 cfs Oct. 7.

1938-68: Maximum daily discharge, 2,030 cfs May 12, 1960; maximum gage height, 7.79 ft June 24, 1943; minimum daily discharge, about 20 cfs Nov. 23, 1946 (caused by ice jams at outlet of Indian Lake); minimum gage height, 2.22 ft Nov. 17, 1955 (ice jam at outlet of Indian Lake); almost no flow occasionally when ice jams form at lake outlet.

Remarks.--Records fair except those below 200 cfs, which are poor. Indian Lake regulated by two vertical lift gates in concrete dam 1 1/2 miles below gage.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	180	430	405	320	269	270	461	704	379	552	237	490
2	175	444	405	315	288	270	478	701	467	554	240	470
3	170	445	398	310	293	270	492	674	527	560	235	450
4	170	448	396	310	291	270	514	659	522	564	237	450
5	165	458	390	305	289	270	526	639	510	566	241	450
6	150	456	386	305	289	269	544	621	508	565	233	460
7	135	445	386	305	293	269	553	601	511	555	261	460
8	225	448	383	300	293	269	581	593	507	551	269	460
9	250	444	377	300	296	271	564	582	506	535	274	460
10	350	443	369	295	295	274	576	557	496	517	318	450
11	389	459	369	290	295	274	583	541	500	507	442	450
12	448	481	367	290	295	271	574	527	496	494	436	450
13	447	472	370	290	295	269	578	514	479	483	430	450
14	453	463	365	290	295	267	604	496	472	449	420	450
15	453	461	353	290	290	269	629	497	464	413	407	450
16	462	457	347	285	290	271	647	503	458	410	417	440
17	453	444	345	280	285	271	670	501	451	401	416	440
18	447	444	347	281	285	276	701	489	448	401	404	450
19	442	448	350	278	285	288	710	485	445	392	416	474
20	448	442	348	276	280	301	707	404	435	391	445	497
21	438	437	356	274	280	308	738	147	442	429	439	502
22	421	442	359	274	280	314	741	151	458	471	456	500
23	419	433	351	271	280	319	732	150	460	462	487	502
24	410	428	340	271	280	316	766	152	462	458	489	524
25	432	428	343	264	275	318	757	156	463	452	459	532
26	421	431	339	264	275	326	754	161	458	446	455	517
27	407	424	331	264	270	334	754	212	482	448	456	512
28	407	439	327	264	270	351	738	367	495	436	459	512
29	396	427	321	264	270	382	726	369	500	422	448	510
30	418	411	321	267	------	411	716	371	522	384	456	513
31	425	------	320	269	------	452	------	381	------	228	475	------
TOTAL	11,006	13,332	11,164	8,861	8,271	9,290	19,114	13,905	14,323	14,496	11,857	14,275
MEAN	355	444	360	286	285	300	637	449	477	468	382	476
MAX	462	481	405	320	296	452	766	704	527	566	489	532
MIN	135	411	320	264	269	267	461	147	379	228	233	440

CAL YR 1967: TOTAL 145,034 MEAN 397 MAX 909 MIN 49 CFSM 1.31 IN. 17.78
WAT YR 1968: TOTAL 149,894 MEAN 410 MAX 766 MIN 135 CFSM 1.36 IN. 18.51

4-0575.1. Sturgeon River near Nahma Junction, Mich.

Location.--Lat 45°56'35", long 86°42'20", in SW 1/4 SE 1/4 sec.17, T.41 N., R.19 W., on left bank, 30 ft upstream from U. S. F. S. 2231 bridge, 500 ft downstream from Mormon Creek, 0.1 mile east of Federal Forest Highway 13, and 3.2 miles north of Nahma Junction.

Drainage area.--183 sq mi.

Records available.--October 1966 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 611.0 ft above mean sea level, datum of 1929.

Extremes.--Maximum discharge during year, 911 cfs July 1 (gage height, 7.57 ft); maximum gage height, 7.77 ft Mar. 29 (ice jam); minimum discharge, 44 cfs Oct. 6, 7; minimum gage height, 3.77 ft Oct. 7.
1967-68: Maximum discharge, 1,130 cfs Apr. 10, 1967 (gage height, 8.30 ft); minimum, 39 cfs Sept. 20, 1967 (gage height, 3.71 ft).

Remarks.--Records good except those for winter periods, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	51	325	130	105	84	64	642	318	248	882	144	107
2	50	320	140	105	88	64	582	288	290	732	129	131
3	48	305	136	100	90	64	525	268	278	578	121	136
4	47	278	126	100	90	64	558	252	249	478	112	126
5	45	252	121	98	90	64	498	235	212	395	105	150
6	44	232	116	96	92	64	465	218	198	322	104	195
7	44	210	120	94	92	64	435	200	382	278	112	186
8	70	192	121	92	92	64	440	186	358	245	121	225
9	110	184	120	90	90	64	455	184	300	222	118	272
10	91	188	120	88	88	64	442	176	268	195	108	352
11	81	208	125	86	86	64	408	168	245	174	97	328
12	76	232	124	84	84	64	382	158	235	160	91	275
13	76	232	120	82	84	64	472	150	222	152	86	230
14	89	220	120	82	82	66	635	147	228	145	80	198
15	91	198	120	80	80	70	808	168	225	139	78	176
16	97	176	120	78	78	80	810	212	205	134	84	164
17	94	178	120	78	78	110	772	318	208	128	104	156
18	89	170	120	78	76	150	840	295	198	140	136	162
19	86	172	120	76	74	200	782	250	222	147	134	180
20	83	166	118	76	74	230	682	215	195	131	270	245
21	80	162	125	76	72	220	662	186	238	164	232	322
22	76	162	135	76	70	210	615	170	418	390	186	285
23	83	160	145	78	70	200	565	160	408	278	238	260
24	84	156	150	78	68	200	585	154	370	202	235	248
25	268	154	145	78	66	210	560	147	330	168	182	230
26	375	150	135	78	66	250	508	140	300	147	156	210
27	345	130	125	80	66	300	462	167	465	164	137	195
28	300	100	120	80	64	370	418	262	595	164	126	180
29	258	90	115	80	64	500	375	308	538	140	115	170
30	272	100	110	80	------	625	350	285	628	137	108	162
31	348	------	110	82	------	692	------	250	------	147	100	------
TOTAL	3,951	5,802	3,872	2,634	2,298	5,515	16,733	6,635	9,256	7,878	4,149	6,256
MEAN	127	193	125	85.0	79.2	178	558	214	309	254	134	209
MAX	375	325	150	105	92	692	840	318	628	882	270	352
MIN	44	90	110	76	64	64	350	140	195	128	78	107
CFSM	.70	1.06	.68	.46	.43	.97	3.05	1.17	1.69	1.39	.73	1.14
IN.	.80	1.18	.79	.54	.47	1.12	3.40	1.35	1.88	1.60	.84	1.27

CAL YR 1967: TOTAL 65,679 MEAN 180 MAX 1,110 MIN 40 CFSM .98 IN 13.35
WAT YR 1968: TOTAL 74,979 MEAN 205 MAX 882 MIN 44 CFSM 1.12 IN 15.24

4-0578. Middle Branch Escanaba River at Humboldt, Mich.

Location.--Lat 46°29'57", long 87°53'11", in SW 1/4 sec.1, T.47 N., R.29 W., on left bank 15 ft upstream from county highway bridge, 0.3 (revised) mile north of Humboldt, and 1.5 miles downstream from Halfway Creek.

Drainage area.--46.0 sq mi.

Records available.--June 1959 to September 1968.

Gage.--Water-stage recorder. V-notch sharp-crested weir since Oct. 3, 1960. Datum of gage is 1,521.20 ft above mean sea level (Cleveland-Cliffs Iron Co. bench mark). Prior to Sept. 1, 1960, wire-weight gage on upstream side of bridge at present datum.

Average discharge.--9 years, 58.4 cfs.

Extremes.--Maximum discharge recorded during year, 575 cfs Sept. 10 (gage height, 5.85 ft); minimum, 7.8 cfs Oct. 5-7 (gage height, 1.65 ft).
1959-68: Maximum discharge, 1,640 cfs Apr. 24, 1960 (gage height, 8.30 ft, from floodmark); minimum, 4.5 cfs Aug. 18, 1961, Aug. 11, 1962; minimum gage height, 1.07 ft Aug. 24, 1960.

Remarks.--Records fair. Since July 1960, some diversion 100 ft above station by industry for iron ore processing. Flow is returned to the basin through the Black River; figures of runoff adjusted.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	10	93	33	15	15	14	269	70	72	164	57	49
2	9.6	83	33	15	16	15	225	63	70	128	48	109
3	9.6	76	33	14	17	15	157	64	63	95	42	92
4	9.2	71	30	14	16	15	146	71	56	76	38	65
5	8.6	68	29	13	15	16	149	64	54	64	35	161
6	8.2	62	28	13	14	17	146	58	110	55	33	228
7	8.6	57	29	13	14	17	113	54	205	49	31	181
8	32	54	29	13	15	18	124	51	279	45	32	180
9	50	56	29	13	16	19	139	49	277	42	31	280
10	45	57	28	13	15	20	138	48	202	40	28	566
11	41	62	28	13	15	20	121	44	198	37	24	430
12	35	65	29	13	16	19	110	41	249	41	21	266
13	37	64	27	13	15	19	122	39	247	44	21	181
14	42	62	26	13	16	20	140	38	186	54	20	132
15	55	57	24	13	14	20	183	45	149	61	18	99
16	65	54	24	13	14	21	172	67	110	64	18	80
17	48	51	24	13	15	28	146	124	96	78	28	69
18	54	50	24	13	16	46	134	105	89	244	26	64
19	87	49	24	13	16	108	122	79	91	342	25	60
20	72	48	22	13	16	120	112	66	79	204	26	63
21	62	45	24	13	16	97	149	58	84	133	29	60
22	53	44	27	13	15	85	158	53	129	114	33	54
23	45	43	26	13	15	80	135	61	128	81	37	57
24	49	41	24	14	15	75	139	70	123	66	72	137
25	150	40	22	14	15	75	134	61	97	57	66	121
26	223	37	21	13	15	82	117	53	82	51	49	83
27	175	37	19	13	15	119	106	75	129	82	38	69
28	110	37	18	13	15	214	94	102	205	90	33	60
29	82	35	18	16	15	346	84	117	209	65	26	53
30	99	34	17	16	------	358	77	100	164	59	21	50
31	109	------	16	15	------	334	------	80	------	62	20	------
TOTAL	1,883.8	1,632	785	419	442	2,452	4,161	2,070	4,232	2,787	1,026	4,101
MEAN	60.8	54.4	25.3	13.5	15.2	79.1	139	66.8	141	89.9	33.1	137
MAX	223	93	33	16	17	358	269	124	279	342	72	566
MIN	8.2	34	16	13	14	14	77	38	54	37	18	49
(+)	.2	.8	1.2	2.2	1.3	1.2	0	1.2	.3	.6	.7	.8
MEAN‡	61.0	55.2	26.5	15.7	16.5	80.3	139	68.0	141	90.5	33.8	138
CFSM‡	1.33	1.20	.58	.34	.36	1.75	3.02	1.48	3.07	1.97	.74	3.00
IN‡	1.53	1.34	.66	.39	.39	2.02	3.37	1.71	3.42	2.27	.84	3.35

CAL YR	1967:	TOTAL	23,459.4	MEAN	64.3	MAX	752	MIN	7.0	MEAN‡	65.3	CFSM‡	1.42	IN.‡	19.27
WTR YR	1968:	TOTAL	25,990.8	MEAN	71.0	MAX	566	MIN	8.2	MEAN‡	71.9	CFSM‡	1.56	IN.‡	21.29

\+ Average monthly diversion, equivalent in cubic feet per second, for industrial use; furnished by Cleveland-Cliffs Iron Co.

‡ Adjusted for diversion.

4-0579. Black River near Republic, Mich.

Location.--Lat 46°25'08", long 87°53'21", in NE¼ sec. 2, T.46 N., R.29 W., on left bank 5 ft downstream from bridge on county highway 2.2 miles downstream from Bruce Creek, and 4.4 miles east of Republic.

Drainage area.--34.4 sq mi.

Records availabe.--July 1961 to September 1968 (converted to low-flow partial-record station October 1968).

Gage.--Water-stage recorder. Altitude of gage is 1,470 ft (from topographic map). Prior to Aug. 23, 1961, wire-weight gage on downstream side of bridge at present datum.

Average discharge.--7 years, 32.9 cfs.

Extremes.--Maximum discharge during year, 270 cfs Sept. 10 (gage height, 3.63 ft); minimum, 5.4 cfs Oct. 4 (gage height 1.10 ft). 1961-68: Maximum discharge, 377 cfs Apr. 25, 1966 (gage height, 4.15 ft); minimum, 0.9 cfs Aug. 5, 6, 1963.

Remarks.--Records good except those for winter months, which are fair. Discharge includes effluent from industrial plant divert into basin from Middle Branch Escanaba River (see sta. no. 4-0578). Records of water temperature and chemical analysis for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	7.0	71	14	9.5	7.7	7.4	93	50	66	105	38	19
2	6.6	63	14	9.0	8.1	7.4	75	46	82	88	30	38
3	6.6	57	14	9.0	8.1	7.4	65	46	66	76	24	38
4	6.2	50	14	9.0	7.7	7.4	68	54	55	64	21	42
5	6.2	46	13	9.0	7.7	7.4	64	55	46	56	20	98
6	5.8	41	13	9.0	7.7	7.4	56	48	58	46	18	101
7	6.2	38	14	9.0	7.7	7.4	53	43	111	40	18	82
8	30	36	13	9.0	7.7	7.4	58	40	129	42	19	90
9	45	34	13	9.0	8.1	8.0	60	41	133	54	19	179
10	34	34	13	9.0	8.1	8.5	55	40	124	42	17	258
11	29	35	13	8.5	8.1	8.5	46	37	138	34	15	208
12	23	35	13	8.5	8.1	8.5	48	34	222	35	11	166
13	23	33	13	8.5	7.7	8.0	60	32	203	34	10	122
14	29	31	13	8.0	7.7	8.0	74	31	168	43	9.9	88
15	40	28	13	8.0	7.4	8.0	99	38	144	41	8.9	70
16	50	26	12	8.0	7.4	9.0	86	56	116	34	9.9	54
17	38	25	12	8.0	7.4	15	82	82	100	42	9.9	50
18	39	26	13	8.0	7.4	25	82	69	89	115	8.9	46
19	56	26	13	8.0	7.4	42	77	56	88	100	8.5	42
20	49	24	13	7.7	7.4	35	74	54	76	70	9.3	44
21	46	22	14	7.7	7.0	30	108	47	86	45	11	40
22	41	22	14	7.7	6.6	25	107	41	117	35	16	34
23	36	22	13	7.7	6.6	23	94	44	116	30	17	34
24	38	21	12	7.4	6.6	23	101	54	120	29	16	65
25	121	21	12	7.4	7.0	29	96	46	95	28	13	86
26	158	20	11	7.4	7.0	40	85	42	80	27	12	74
27	120	18	10	7.0	7.4	60	78	70	113	76	10	63
28	90	17	10	7.4	7.4	134	70	90	131	66	8.9	54
29	76	16	10	8.1	7.4	160	64	93	117	46	8.1	46
30	82	15	9.5	8.5	------	132	58	80	100	38	8.1	42
31	82	------	9.5	8.1	------	118	------	68	------	44	7.7	------
TOTAL	1,419.6	953	388.0	256.1	217.6	1,016.7	2,236	1,627	3,289	1,625	453.1	2,373
MEAN	45.8	31.8	12.5	8.26	7.50	32.8	74.5	52.5	110	52.4	14.6	79.1
MAX	158	71	14	9.5	8.1	160	108	93	222	115	38	258
MIN	5.8	15	9.5	7.0	6.6	7.4	46	31	46	27	7.7	19
CFSM	1.33	.92	.36	.24	.22	.95	2.17	1.53	3.19	1.52	.42	2.30
IN.	1.53	1.03	.42	.28	.24	1.10	2.42	1.76	3.56	1.76	.49	2.57

CAL YR 1967: TOTAL 15,204.1 MEAN 41.7 MAX 342 MIN 4.7 CFSM 1.21 IN 16.44
WAT YR 1968: TOTAL 15,854.1 MEAN 43.3 MAX 258 MIN 5.8 CFSM 1.26 IN 17.14

4-0580. Middle Branch Escanaba River near Ishpeming, Mich.

Location.—Lat 46°23'40", long 87°45'30", in NW¼ SW¼ sec. 12, T.46 N., R.28 W., on left bank 0.5 mile downstream from County Highway 581, 6 miles southwest of Ishpeming, and 10 miles east of Republic.

Drainage area.—128 sq mi.

Records available.—June 1954 to September 1968.

Gage.—Water-stage recorder. Datum of gage is 1,389.02 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources).

Average discharge.—14 years, 135 cfs.

Extremes.—Maximum discharge during year, 954 cfs Sept. 11 (gage height, 7.39 ft); minimum, 29 cfs Oct. 6 (gage height, 1.46 ft).

1954-68: Maximum discharge, 2,680 cfs Apr. 25, 1960 (gage height, 12.55 ft); minimum, 12 cfs Aug. 21-23, 1957; minimum gage height, 1.17 ft Aug. 22, 23, 1957.

Remarks.—Records good except those for winter months, which are fair. Some flow diverted and returned above station by iron ore processing plant. Records of water temperatures for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	37	270	72	44	39	34	539	178	208	400	143	70
2	35	230	73	42	39	35	446	158	222	364	119	154
3	33	202	73	41	40	35	359	153	211	286	103	181
4	33	184	72	40	40	35	296	172	174	221	90	157
5	31	168	70	39	41	36	252	172	150	183	84	275
6	30	150	70	38	42	37	262	156	195	156	79	416
7	31	138	71	37	43	38	227	140	403	134	76	440
8	73	131	72	36	43	39	228	129	509	123	79	406
9	154	133	71	35	43	40	248	126	549	144	82	542
10	145	130	70	34	43	41	248	123	531	130	76	778
11	112	134	70	34	42	42	233	115	459	106	68	926
12	104	138	71	33	41	42	218	107	510	106	62	838
13	94	136	68	33	40	42	250	100	610	110	59	595
14	108	131	68	32	40	42	296	99	570	127	56	400
15	122	116	67	32	39	44	374	112	459	147	53	268
16	175	129	66	32	38	48	400	192	362	131	56	208
17	157	116	64	31	38	56	365	316	293	141	61	175
18	136	110	65	31	37	90	328	317	260	254	61	157
19	185	106	64	31	37	150	302	239	244	394	58	152
20	201	108	61	31	37	280	278	191	222	466	60	153
21	106	110	67	32	36	250	342	167	238	328	59	152
22	88	99	85	32	36	210	392	145	338	224	73	144
23	68	93	84	33	35	190	371	145	390	181	83	134
24	129	89	72	34	35	170	353	171	400	147	86	185
25	300	88	66	35	35	165	348	165	358	126	100	268
26	467	86	60	36	35	170	318	144	278	115	89	242
27	517	80	56	37	35	200	282	190	320	185	76	191
28	422	80	54	38	35	370	246	290	442	236	66	164
29	288	82	52	38	34	584	220	340	474	183	60	147
30	263	73	48	39	------	669	199	312	445	145	53	134
31	290	------	46	39	------	634	------	251	------	145	55	------
TOTAL	4,934	3,840	2,068	1,099	1,118	4,818	9,220	5,615	10,824	6,138	2,325	9,052
MEAN	159	128	66.7	35.5	38.6	155	307	181	361	198	75.0	302
MAX	517	270	85	44	43	669	539	340	610	466	143	926
MIN	30	73	46	31	34	34	199	99	150	106	53	70
CFSM	1.24	1.00	.52	.28	.30	1.21	2.40	1.42	2.82	1.55	.59	2.36
IN.	1.43	1.12	.60	.32	.32	1.40	2.68	1.63	3.14	1.78	.68	2.63

CAL YR 1967: TOTAL 57,350 MEAN 157 MAX 1,300 MIN 27 CFSM 1.23 IN 16.66
WAT YR 1968: TOTAL 61,051 MEAN 167 MAX 926 MIN 30 CFSM 1.30 IN 17.74

4-0581. Middle Branch Escanaba River near Princeton, Mich.

Location.--Lat 46°19'02", long 87°30'07", in NW 1/4 sec.12, T.45 N., R.26 W., on right bank 400 ft downstream from powerplant, 0.3 mile upstream from Green Creek, and 2.2 (revised) miles northwest of Princeton.

Drainage area.--210 sq mi.

Records available.--July 1961 to September 1968.

Gage.--Digital water-stage recorder. Altitude of gage is 1,100 ft (from topographic map). Prior to July 17, 1963, graphic water-stage recorder at present site and datum.

Average discharge.--7 years, 198 cfs.

Extremes.--Maximum discharge during year, 1,070 cfs Sept. 12 (gage height, 5.11 ft); minimum, 4.6 cfs Mar. 16 (gage height, 0.45 ft); minimum daily, 5.0 cfs on several days during the year.
1961-68: Maximum discharge, 1,830 cfs May 11, 1965; maximum gage height, 7.44 ft Jan. 23, 1967; minimum daily discharge, 4.1 cfs Feb. 4, 1967.

Remarks.--Records good except those for winter months or those below 100 cfs, which are fair. Flow regulated by powerplant above station. Some flow diverted and returned above station by iron ore processing plant. Records of chemical analyses for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.6	386	110	110	130	170	728	370	390	607	242	110
2	111	379	110	50	90	5.0	621	246	385	542	226	360
3	111	377	110	110	5.0	5.0	533	341	379	486	222	360
4	109	374	150	50	5.0	110	469	234	376	416	222	360
5	170	370	110	50	110	80	420	236	320	393	117	358
6	42	202	150	50	110	80	407	237	239	388	171	365
7	5.8	186	55	50	110	150	400	237	255	379	171	421
8	7.4	225	110	110	110	50	392	244	746	101	115	568
9	248	245	110	50	50	5.0	386	300	752	241	166	697
10	376	207	110	110	5.0	5.0	380	228	700	243	161	910
11	308	171	110	50	5.0	120	378	225	670	242	162	1,030
12	234	171	110	80	110	120	270	213	641	212	50	1,060
13	132	226	120	80	110	120	274	49	679	211	165	919
14	5.8	241	110	80	110	120	303	112	730	211	106	673
15	233	246	110	80	110	120	460	243	663	210	106	499
16	371	205	110	50	100	5.0	540	239	550	210	48	402
17	235	183	110	50	5.0	5.0	537	262	466	244	108	378
18	299	170	110	50	5.0	250	500	404	411	244	110	373
19	235	170	110	150	110	190	459	418	389	276	110	238
20	179	184	110	5.0	80	300	431	341	384	424	110	216
21	7.0	111	150	5.0	80	420	455	382	387	518	170	205
22	292	173	55	80	80	350	505	376	413	400	170	212
23	375	161	55	80	100	290	534	233	538	396	160	264
24	363	178	55	80	5.0	160	527	368	592	388	150	374
25	250	166	55	80	5.0	240	504	261	562	254	150	365
26	379	167	170	150	110	240	480	323	492	200	170	365
27	463	55	170	5.0	110	240	441	95	502	172	170	360
28	572	113	170	5.0	50	400	406	262	621	236	150	360
29	481	110	110	110	50	600	374	416	655	289	170	360
30	408	110	110	110	------	790	383	466	643	374	110	130
31	390	------	60	110	------	799	------	432	------	362	110	------
TOTAL	7,398.6	6,262	3,395	2,230.0	2,060.0	6,539.0	13,497	8,793	15,530	9,869	4,568	13,292
MEAN	239	209	110	71.9	71.0	211	450	284	518	318	147	443
MAX	572	386	170	150	130	799	728	466	752	607	242	1,060
MIN	5.8	55	55	5.0	5.0	5.0	270	49	239	101	48	110
CFSM	1.14	.99	.52	.34	.34	1.00	2.14	1.35	2.47	1.52	.70	2.11
IN.	1.31	1.11	.60	.39	.36	1.16	2.39	1.56	2.75	1.75	.81	2.35

CAL YR 1967 TOTAL 86,158.0 MEAN 236 MAX 1,430 MIN 4.1 CFSM 1.12 IN 15.26
WTR YR 1968 TOTAL 93,433.6 MEAN 255 MAX 1,060 MIN 5.0 CFSM 1.22 IN 16.55

4-0581.9 Schweitzer Reservoir near Palmer, Mich.

Location.--Lat 46°25'00", long 87°38'48", in SE 1/4 NW 1/4 sec.2, T.46 N., R.27 W., on left bank 120 ft upstream from dam on Schweitzer Creek and 3 miles southwest of Palmer.

Drainage area.--23 1 sq mi.

Records available.--January 1963 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 1300.00 ft above mean sea level, datum of 1929. Gage readings have been converted to elevations above mean sea level.

Extremes.--Maximum contents during the year, 5,580 acre-ft Sept. 9, 10 (elevation, 1338.7 ft); minimum recorded, 3,625 acre-ft Mar. 17 (elevation, 1332.5 ft).

1963-68: Maximum contents recorded, that of Sept. 9, 10, 1968; minimum recorded, that of Mar. 17, 1968.

Remarks.--Records good. Reservoir is formed by an earth-fill dam with a fixed crest concrete spillway completed in 1963. Capacity of reservoir is 5,300 acre-ft at spillway elevation 1338.00 ft. The dam includes a discharge pipe equipped with value to control released flow to Schweitzer Creek (sta. no. 4-0582). An average of 10.8 cfs was diverted from the reservoir for iron ore processing and returned to the Middle Branch Escanaba River basin by Green Creek.

Month-end elevation and contents, water year October 1967 to September 1968

	Elevation (feet)‡	Contents (Acre-feet)	Change in contents during month (Acre-feet)	Equivalent in cfs
Sept. 30	1334.5	4,200	-	-
Oct. 31	1337.1	4,980	+780	+12.7
Nov. 30	1337.2	5,020	+ 40	+ .7
Dec. 31	1336.5	4,800	-220	- 3.6
Calendar year 1967	-	-	-360	- 0.5
Jan. 31	1334.8	4,290	-510	- 8.3
Feb. 29	1333.4	3,870	-420	- 7.3
Mar. 31	1336.5	4,800	+930	+15.1
Apr. 30	1338.1	5,340	+540	+ 9.1
May 31	1338.2	5,380	+ 40	+ .6
June 30	1338.1	5,340	- 40	- .7
July 31	1338.0	5,300	- 40	- .6
Aug. 31	1337.4	5,090	-210	- 3.4
Sept. 30	1338.0	5,300	+210	+ 3.5
Water year 1967-68	-	-	+1100	+ 1.5

‡ Elevation at 2400 hours.

4-0582. Schwietzer Creek near Palmer, Mich.

Location.--Lat 46°24'40", long 87°37'27", in SW 1/4 sec.1, T.46 N., R.27 W., on right bank 10 ft upstream from highway bridge, 2.5 miles southwest of Palmer.

Drainage area.--23.6 sq mi.

Records available.--October 1960 to September 1968.

Gage.--Digital water-stage recorder. Concrete control since Oct. 1, 1963. Altitude of gage is 1,270 ft (from topographic map). Prior to Aug. 21, 1961, wire-weight gage on upstream side of bridge at present datum. Aug. 21, 1961, to Oct. 27, 1965, graphic water-stage recorder at present site and datum.

Average discharge.--8 years, 17.2 cfs.

Extremes.--Maximum discharge during year, 255 cfs Sept. 10 (gage height, 4.70 ft); minimum daily, 2.9 cfs Aug. 4, 6.

1960-68: Maximum discharge, 285 cfs Apr. 21, 1966 (gage height, 4.82 ft); minimum discharge, 0.4 cfs Sept. 6, 1962 (gage height, 1.22 ft).

Remarks.--Records fair. Since August 1962, flow completely regulated by Schweitzer Reservoir (usable capacity, 231,000,000 cu ft), 1 mile above station. An average of about 2.7 cfs was diverted from headwaters of basin by the city of Ishpeming for municipal supply and effluent discharged to the Carp River Basin. An average of 10.7 cfs was diverted from basin 1 mile above station by industry for iron ore processing and returned to the Middle Branch Escanaba River Basin. Records of water temperatures for the water year 1968 are published in part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.7	3.8	3.8	3.3	3.3	3.5	4.0	15	26	72	5.3	6.5
2	4.7	3.8	3.8	3.3	3.3	3.4	3.9	14	28	57	4.2	9.5
3	4.7	3.8	3.8	3.3	3.3	3.4	3.9	14	27	42	3.3	27
4	4.7	3.8	3.8	3.3	3.5	3.4	4.5	19	20	33	2.9	22
5	4.7	3.8	3.8	3.3	3.4	3.4	7.8	17	16	26	3.0	50
6	4.2	3.8	3.8	3.2	3.5	3.5	14	13	33	20	2.9	61
7	4.0	3.8	3.8	3.2	3.5	3.6	17	10	77	18	3.4	40
8	5.1	3.8	3.8	3.2	3.5	3.6	24	9.0	120	18	4.5	42
9	4.2	3.8	3.8	3.2	3.5	3.6	30	8.9	89	28	4.3	147
10	4.2	3.6	3.8	3.2	3.5	3.6	27	7.2	62	20	4.2	218
11	4.0	3.6	3.8	3.2	3.5	3.6	22	6.2	65	15	4.2	109
12	3.8	3.6	3.8	3.2	3.5	3.6	20	5.1	77	14	4.2	64
13	4.0	3.6	3.8	3.2	3.5	3.6	36	4.0	60	13	4.2	40
14	3.8	3.8	3.7	3.1	3.5	3.6	55	3.6	47	21	4.2	27
15	4.0	3.6	3.7	3.1	3.5	3.7	63	5.3	37	25	4.3	21
16	3.8	3.8	3.6	3.1	3.5	3.6	56	39	27	19	4.6	15
17	3.8	3.8	3.6	3.1	3.5	3.8	48	103	25	15	4.4	12
18	4.2	3.8	3.6	3.1	3.5	4.4	42	76	27	23	4.2	12
19	4.0	3.8	3.5	3.0	3.5	5.1	35	45	26	20	4.4	12
20	3.8	3.8	3.5	3.1	3.5	4.5	32	28	20	14	4.3	16
21	3.8	3.8	3.8	3.0	3.5	4.4	51	19	35	11	4.6	17
22	3.8	3.8	3.5	3.1	3.5	3.9	58	14	85	9.1	4.5	13
23	3.8	3.8	3.5	3.1	3.5	3.6	51	16	90	5.0	4.5	17
24	5.1	3.8	3.6	3.1	3.5	3.6	59	17	81	4.5	4.3	38
25	4.9	3.8	3.4	3.3	3.5	4.1	50	15	61	3.6	4.3	41
26	4.2	3.8	3.4	3.3	3.5	4.4	40	12	48	3.8	4.2	26
27	4.0	3.6	3.4	3.3	3.5	5.0	31	27	72	9.6	4.2	18
28	4.0	3.7	3.4	3.3	3.5	5.5	26	55	120	11	4.1	13
29	4.0	3.7	3.4	3.3	3.5	4.9	22	63	100	6.4	4.1	11
30	4.2	3.7	3.4	3.3	------	4.3	18	48	74	5.7	3.8	10
31	3.8	------	3.4	3.1	------	4.3	------	31	------	7.4	3.8	------
TOTAL	130.0	112.5	112.8	98.9	100.8	122.5	951.1	759.3	1,675	590.1	127.4	1,155.0
MEAN	4.19	3.75	3.64	3.19	3.48	3.95	31.7	24.5	55.8	19.0	4.11	38.5
MAX	5.1	3.8	3.8	3.3	3.5	5.5	63	103	120	72	5.3	218
MIN	3.8	3.6	3.4	3.0	3.3	3.4	3.9	3.6	16	3.6	2.9	6.5

CAL YR 1967 TOTAL 5,978.3 MEAN 16.4 MAX 188 MIN 3.4
WTR YR 1968 TOTAL 5,935.4 MEAN 16.2 MAX 218 MIN 2.9

4-0583. Warner Creek near Palmer, Mich.

Location.--Lat 46°24'09", long 87°32'39", in NW 1/4 sec.10, T.46 N., R.26 W., on left bank 10 ft upstream from bridge on county highway, 0.1 mile upstream from confluence with Schweitzer Creek, and 3.5 miles southeast of Palmer.

Drainage area.--14.2 sq mi.

Records available.--July 1961 to September 1968 (converted to low-flow partial-record station October 1968).

Gage.--Water-stage recorder. Altitude of gage is 1,190 ft (from topographic map). Prior to Aug. 22, 1961, wire-weight gage on upstream side of bridge at present datum.

Average discharge.--7 years, 15.8 cfs.

Extremes.--Maximum discharge during year, 244 cfs Sept. 10 (gage height, 5.37 ft); minimum daily discharge, 3.1 cfs Feb. 27 to Mar. 2.

1961-68: Maximum discharge, 267 cfs Apr. 14, 1964 (discharge measurement); maximum gage height, 5.61 ft Apr. 14, 1964; minimum discharge, 0.5 cfs Sept. 10, 1961 (gage height, 0.79 ft).

Remarks.--Records fair except those for winter months, which are poor.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	5.0	18	6.6	5.0	4.2	3.1	48	24	27	60	11	17
2	4.7	17	6.7	4.8	4.3	3.1	43	24	27	46	9.8	39
3	4.4	16	6.8	4.7	4.3	3.2	38	24	24	34	8.5	28
4	4.4	14	6.8	4.6	4.4	3.2	37	26	21	28	7.9	21
5	3.9	13	6.8	4.5	4.5	3.3	37	24	19	26	7.9	38
6	3.9	12	6.8	4.3	4.7	3.6	33	19	34	24	7.5	42
7	4.4	12	6.8	4.2	4.8	4.0	30	18	133	20	7.2	31
8	15	11	6.8	4.0	4.9	4.5	31	17	165	24	7.5	34
9	19	12	7.0	4.0	4.9	5.0	32	17	105	34	8.8	98
10	13	12	7.0	4.0	4.9	5.5	28	16	57	27	7.9	226
11	12	12	7.0	4.2	5.0	5.8	25	15	53	21	7.0	140
12	10	12	7.0	4.4	5.0	5.8	26	14	64	20	6.4	62
13	9.8	11	6.9	4.5	5.0	5.7	44	14	51	19	6.7	43
14	10	10	6.8	4.5	4.9	5.5	51	13	42	23	6.7	30
15	11	9.8	6.7	4.6	4.9	5.5	57	15	34	22	6.4	24
16	12	9.5	6.6	4.6	4.8	6.0	45	30	29	22	7.5	22
17	9.2	9.5	6.4	4.7	4.8	7.0	37	57	29	19	12	18
18	10	10	6.4	4.7	4.8	10	35	52	30	19	10	17
19	14	9.8	6.5	4.7	4.7	30	30	30	28	18	8.8	17
20	12	9.0	7.0	4.6	4.6	37	30	24	24	13	11	21
21	10	8.8	7.5	4.6	4.3	32	50	20	34	13	10	19
22	9.5	8.8	7.5	4.5	4.0	28	48	18	66	12	12	17
23	9.2	8.5	7.2	4.3	3.8	26	41	20	74	11	13	16
24	11	8.2	6.5	4.2	3.7	27	47	22	72	10	17	18
25	31	8.2	6.2	4.0	3.5	28	45	19	53	9.5	12	18
26	28	8.2	5.8	3.9	3.3	32	36	17	38	9.5	11	16
27	23	7.0	5.7	3.9	3.1	37	31	28	63	17	9.5	15
28	19	6.0	5.5	3.8	3.1	82	28	47	147	14	8.2	14
29	16	6.2	5.5	3.9	3.1	99	27	50	110	11	7.5	13
30	20	6.5	5.3	4.0	------	71	26	37	66	11	6.7	12
31	21	------	5.1	4.1	------	58	------	28	------	12	6.2	------
TOTAL	385.4	316.0	203.2	134.8	126.3	676.8	1,116	779	1,719	649.0	279.6	1,126
MEAN	12.4	10.5	6.55	4.35	4.36	21.8	37.2	25.1	57.3	20.9	9.02	37.5
MAX	31	18	7.5	5.0	5.0	99	57	57	165	60	17	226
MIN	3.9	6.0	5.1	3.8	3.1	3.1	25	13	19	9.5	6.2	12
CFSM	.88	.74	.46	.31	.31	1.54	2.62	1.77	4.04	1.47	.64	2.64
IN.	1.01	.83	.53	.35	.33	1.77	2.92	2.04	4.50	1.70	.73	2.95

CAL YR 1967: TOTAL 6,315.0 MEAN 17.3 MAX 138 MIN 3.3 CFSM 1.22 IN 16.54
WAT YR 1968: TOTAL 7,511.1 MEAN 20.5 MAX 226 MIN 3.1 CFSM 1.45 IN 19.67

PEAK DISCHARGE (BASE, 60 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
03-29	0700	3.13	101	06-24	0100	3.32	82
05-15	2000	2.87	61	06-28	1500	4.26	155
06-08	0200	4.60	182	09-10	1100	5.37	244

4-0584. Goose Lake Outlet near Sands Station, Mich.

Location.--Lat 46°23'36", long 87°29'40", in SE¼ SE¼ sec.12, T.46 N., R.26 W., on left bank 0.8 mile upstream from mouth and 3 miles west of Sands Station.

Drainage area.--37.5 sq mi.

Records available.--October 1965 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 1,160 ft (from topographic map).

Extremes.--Maximum discharge during year, 236 cfs June 28 or 29 (gage height, 4.36 ft); minimum, 6.2 cfs Oct. 6, 7, (gage height, 1.47 ft).

1965-68: Maximum discharge, 315 cfs Apr. 4, 1967 (gage height, 5.02 ft); minimum, 6.2 cfs Oct. 12, 13, 1966, Oct. 6, 7, 1967; minimum gage height, 1.45 ft Oct. 12, 13, 1966.

Remarks.--Records fair. Some mine water pumped into basin at headwaters.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	7.0	23	13	11	9.0	9.0	101	45	43	130	20	22
2	6.6	25	13	11	9.0	9.0	85	42	42	115	19	24
3	6.6	25	13	10	9.0	9.0	75	42	40	102	18	22
4	6.6	24	13	10	9.0	9.0	70	42	37	87	17	22
5	6.6	24	13	9.5	9.0	9.0	65	39	35	76	17	33
6	6.2	22	13	9.0	9.0	9.5	66	37	48	64	17	30
7	6.6	21	13	8.5	9.0	9.5	62	36	72	57	16	29
8	14	19	14	9.0	9.0	9.5	62	35	83	54	18	35
9	11	20	14	9.5	9.0	9.5	60	33	84	56	31	59
10	12	20	13	9.5	9.0	10	56	31	79	48	18	92
11	11	20	13	9.5	9.0	10	53	30	75	44	17	94
12	10	20	13	9.5	9.0	10	51	29	81	41	16	78
13	11	20	13	9.5	9.0	10	60	28	82	40	21	64
14	11	19	12	10	9.0	11	62	27	78	42	16	53
15	11	17	13	10	9.0	11	66	28	70	40	16	47
16	10	16	13	10	9.0	12	64	40	60	43	16	41
17	10	17	13	10	9.0	13	62	41	58	37	16	37
18	12	17	13	10	9.0	15	60	41	56	35	16	35
19	14	18	13	10	9.0	30	55	41	53	35	16	32
20	13	16	12	10	9.0	50	53	38	49	33	16	41
21	12	16	14	9.5	9.0	42	60	35	58	31	15	33
22	12	16	14	9.5	9.0	37	58	35	64	30	16	33
23	12	16	13	9.5	9.0	35	60	35	84	26	17	32
24	15	16	13	9.5	9.0	35	63	35	80	24	20	30
25	26	15	12	9.5	9.0	40	63	33	75	21	17	27
26	22	15	12	9.0	9.0	50	61	32	72	28	17	27
27	22	14	12	9.0	9.0	59	56	37	111	32	16	26
28	23	13	12	9.0	9.0	93	53	44	210	28	16	25
29	24	13	12	9.0	9.0	138	50	44	200	25	16	24
30	27	13	12	9.0	------	121	48	46	160	23	16	24
31	27	------	12	9.0	------	120	------	44	------	22	13	------
TOTAL	418.2	550	398	297.0	261.0	1,035.0	1,860	1,145	2,339	1,469	536	1,171
MEAN	13.5	18.3	12.8	9.58	9.00	33.4	62.0	36.9	78.0	47.4	17.3	39.0
MAX	27	25	14	11	9.0	138	101	46	210	130	31	94
MIN	6.2	13	12	8.5	9.0	9.0	48	27	35	21	13	22
CFSM	.36	.49	.34	.26	.24	.89	1.65	.98	2.08	1.26	.46	1.04
IN.	.41	.55	.39	.29	.26	1.03	1.84	1.14	2.32	1.46	.53	1.16

CAL YR 1967: TOTAL 10,781.0 MEAN 29.5 MAX 290 MIN 6.2 CFSM .79 IN 10.69
WAT YR 1968: TOTAL 11,479.2 MEAN 31.4 MAX 210 MIN 6.2 CFSM .84 IN 11.38

4-0585. East Branch Escanaba River at Gwinn, Mich.

Location.--Lat 46°17'10", long 87°26'00", in NE¼ sec. 21, T.45 N., R.25 W., on right bank in county park at Gwinn, 1 mile upstream from mouth.

Drainage area.--124 sq mi.

Records available.--October 1954 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 1,079.2 ft above mean sea level, datum of 1929.

Average discharge.--14 years, 99.7 cfs.

Extremes.--Maximum discharge during year, 802 cfs June 8 (gage height, 10.91 ft); minimum, 27 cfs Jan. 9 (gage height, 6.64 ft).
1954-68: Maximum discharge, 1,920 cfs Apr. 25, 1960 (gage height, 14.44 ft); minimum, 19 cfs July 30, Oct. 11, 1963 (gage height, 6.48 ft).

Remarks.--Records excellent except those for winter months, which are good. Since August, 1962, flow partly regulated by Schweitzer Reservoir (usable capacity, 231,000,000 cu ft). Water diverted from basin for municipal supply and for iron ore processing (see sta. no. 4-0582). Records of chemical analyses for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	32	91	40	38	36	31	246	133	163	414	75	60
2	32	87	41	38	34	31	210	121	169	338	64	170
3	31	90	42	37	35	31	176	120	156	276	58	154
4	30	83	41	36	35	31	181	136	134	228	53	127
5	30	77	40	34	34	31	163	127	116	194	51	164
6	28	70	40	32	34	31	172	113	126	170	50	204
7	29	65	41	30	34	31	166	103	442	148	49	180
8	56	64	41	29	34	32	174	96	745	134	48	172
9	80	63	41	28	34	32	184	92	575	170	62	300
10	64	67	41	30	34	32	170	88	386	158	55	580
11	59	67	41	33	34	32	152	84	318	132	49	595
12	50	65	41	34	34	32	144	80	378	116	48	360
13	47	60	41	35	34	33	228	75	348	109	46	246
14	47	59	42	34	34	33	286	72	288	121	45	182
15	49	56	43	34	34	34	330	79	254	133	44	145
16	50	54	40	34	34	37	290	120	204	125	47	121
17	46	52	39	34	33	41	248	164	182	111	57	111
18	46	54	40	34	33	57	238	266	178	103	55	98
19	62	54	40	34	33	117	206	196	178	105	52	97
20	58	52	40	34	33	160	187	151	157	95	61	117
21	51	50	40	34	33	125	262	124	187	96	56	118
22	47	50	54	34	32	110	276	106	338	92	60	104
23	45	49	48	32	32	100	250	110	362	79	62	101
24	47	48	43	32	32	98	268	121	378	70	69	104
25	139	48	41	32	32	105	274	107	322	66	62	113
26	144	47	40	32	32	136	236	96	256	60	55	107
27	106	46	40	31	31	182	204	126	360	91	52	96
28	91	45	40	32	31	324	176	144	615	95	48	87
29	83	41	40	34	31	432	160	175	635	79	46	80
30	97	40	39	36	------	372	146	232	480	70	44	75
31	106	------	39	36	------	324	------	182	------	77	43	------
TOTAL	1,882	1,794	1,279	1,037	966	3,197	6,403	3,939	9,430	4,255	1,666	5,168
MEAN	60.7	59.8	41.3	33.5	33.3	103	213	127	314	137	53.7	172
MAX	144	91	54	38	36	432	330	266	745	414	75	595
MIN	28	40	39	28	31	31	144	72	116	60	43	60
CFSM	.49	.48	.33	.27	.27	.83	1.72	1.02	2.53	1.11	.43	1.39
IN.	.56	.54	.38	.31	.29	.96	1.92	1.18	2.83	1.28	.50	1.55

CAL YR 1967: TOTAL 39,205 MEAN 107 MAX 750 MIN 28 CFSM .87 IN 11.76
WAT YR 1968: TOTAL 41,016 MEAN 112 MAX 745 MIN 28 CFSM .90 IN 12.30

GPO 817-436-5

4-0590. Escanaba River at Cornell, Mich.

Location.--Lat 45°54'31", long 87°12'49", in NW 1/4 sec.32, T.41 N., R.23 W., on right bank 50 ft downstream from highway bridge, 0.4 (revised) mile downstream from Bobs Creek, 0.7 (revised) mile northeast of Cornell, and 16 miles upstream from mouth.

Drainage area.--870 sq mi.

Records available.--August 1903 to December 1912, January 1913 to November 1915 (gage heights only), October 1950 to September 1968. Monthly discharge only for some periods, published in WSP 1307. Published as "near Escanaba" 1903-15.

Gage.--Digital water-stage recorder. Datum of gage is 749.26 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). August 1903 to November 1915, chain gage at site 10 miles downstream at different datum. October 1950 to July 17, 1963, graphic water-stage recorder at present site and datum.

Average discharge.--27 years (1903-12, 1950-68), 899 cfs.

Extremes.--Maximum discharge during year, 4,800 cfs June 30 (gage height, 3.67 ft); maximum gage height, 4.35 ft Mar. 22 (ice jam); minimum daily discharge, 150 cfs Jan. 3, Feb. 10-13; minimum gage-height, 1.26 ft Oct. 1. 1903-12, 1950-68: Maximum discharge, 10,500 cfs May 7, 1960 (gage height, 4.90 ft); maximum gage height, 5.72 ft Apr. 7, 1956 (ice jam); minimum discharge observed, 90 cfs July 5, 1910 (gage height, 1.5 ft), but may have been less during extended periods of no gage-height record during winter seasons of 1903-12, or during period of ice effect in 1959.

Remarks.--Records good except those for winter months, which are fair. Diurnal fluctuation and occasional slight regulation caused by Boney Falls powerplant, 7 miles above station, since 1950. Since August 1962, some regulation by Schweitzer Reservoir (capacity, 231,000,000 cu ft), at headwaters. (see sta. no. 502).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	204	1,510	520	170	350	290	2,390	1,380	1,880	4,180	1,060	441
2	208	1,460	450	160	320	290	1,950	1,180	1,950	3,250	784	837
3	211	1,400	230	150	160	180	1,720	1,100	1,790	2,620	761	1,410
4	256	1,220	400	160	160	220	1,650	1,280	1,600	2,140	691	1,430
5	282	1,150	540	170	160	340	1,510	1,140	1,420	1,770	657	1,460
6	311	1,010	410	170	180	310	1,370	1,120	1,320	1,580	528	1,500
7	252	794	420	180	210	350	1,380	1,010	1,860	1,270	559	1,540
8	257	678	400	190	270	310	1,380	953	2,810	1,240	553	1,870
9	409	829	330	250	200	320	1,450	991	3,100	832	490	2,460
10	757	822	210	180	150	180	1,400	940	2,430	966	555	3,510
11	792	775	350	200	150	270	1,320	855	2,260	873	519	3,870
12	649	615	430	230	150	330	1,280	500	2,310	824	459	3,280
13	497	704	350	250	150	380	1,500	765	2,180	753	381	2,690
14	482	745	250	170	340	380	1,980	531	2,110	747	452	2,600
15	370	653	200	300	300	340	2,560	799	2,030	929	385	1,640
16	520	716	330	270	300	300	2,680	1,170	1,710	856	385	1,290
17	692	700	300	210	200	300	2,580	1,650	1,510	669	363	1,110
18	645	672	520	240	150	500	2,560	1,800	1,390	797	468	1,020
19	530	480	350	300	170	1,100	2,360	1,790	1,380	759	518	1,050
20	543	631	270	250	190	1,000	2,180	1,540	1,290	897	726	899
21	441	503	530	220	240	1,200	2,430	1,340	1,470	1,230	744	1,060
22	313	550	400	230	290	1,100	2,540	1,090	2,320	1,440	770	953
23	646	594	250	220	320	1,200	2,500	1,180	2,630	1,180	695	900
24	698	580	200	250	200	900	2,580	1,380	2,690	1,040	661	1,070
25	1,620	576	250	280	180	600	2,540	1,400	2,510	834	587	1,050
26	1,730	440	300	330	220	1,100	2,320	1,080	2,120	732	549	916
27	1,830	350	350	250	270	1,500	2,070	1,190	2,510	873	539	587
28	1,830	250	380	190	290	2,000	1,830	1,640	3,260	1,340	500	909
29	1,660	300	460	180	280	2,310	1,680	2,240	3,390	1,260	454	871
30	1,550	400	310	300	------	2,700	1,520	2,240	3,940	1,250	455	737
31	1,560	------	160	360	------	2,740	------	1,990	------	1,320	388	------
TOTAL	22,745	22,107	10,850	7,010	6,550	25,040	59,210	39,264	65,170	40,451	17,636	44,960
MEAN	734	737	350	226	226	808	1,974	1,267	2,172	1,305	569	1,499
MAX	1,830	1,510	540	360	350	2,740	2,680	2,240	3,940	4,180	1,060	3,870
MIN	204	250	160	150	150	180	1,280	500	1,290	669	363	441
CFSM	.84	.85	.40	.26	.26	.93	2.27	1.46	2.50	1.50	.65	1.72
IN.	.97	.95	.46	.30	.28	1.07	2.53	1.68	2.79	1.73	.75	1.92

CAL YR 1967 TOTAL 318,091 MEAN 871 MAX 5,550 MIN 160 CFSM 1.00 IN 13.60
WTR YR 1968 TOTAL 360,993 MEAN 986 MAX 4,180 MIN 150 CFSM 1.13 IN 15.43

4-0595. Ford River near Hyde, Mich.

Location.--Lat 45°45'20", long 87°12'05", in SW¼ sec. 19, T.39 N., R.23 W., on right bank 40 ft downstream from county highway bridge, 1.4 miles downstream from Tenmile Creek, and 1.5 miles north of Hyde.

Drainage area.--450 sq mi.

Records available.--October 1954 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 677.9 ft above mean sea level, datum of 1929.

Average discharge.--14 years, 351 cfs.

Extremes.--Maximum discharge during year, 2,570 cfs July 1 (gage height, 5.39 ft); minimum daily, 40 cfs Jan. 7-10; minimum gage height, 1.55 ft Oct. 7.
1954-68: Maximum discharge, 7,590 cfs May 7, 1960 (gage height, 8.27 ft); minimum, 23 cfs Aug. 22, 23, 1957 (gage height 1.39 ft); minimum gage height, 1.36 ft Aug. 12, 1963.

Remarks.--Records good except those for winter months, which are fair. Records of water temperatures for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	50	762	125	54	50	44	734	769	1,400	2,540	480	191
2	50	734	125	50	50	44	620	664	1,400	2,520	435	499
3	52	671	120	48	50	46	542	620	1,280	2,330	384	872
4	52	602	115	46	50	46	638	685	1,110	1,980	318	909
5	52	514	115	44	50	46	578	699	954	1,700	276	962
6	49	450	110	42	50	48	542	671	811	1,340	250	1,150
7	48	376	110	40	48	48	515	614	811	962	226	1,200
8	77	307	105	40	48	50	502	548	706	734	214	1,500
9	77	327	105	40	46	52	514	497	706	706	215	1,820
10	117	303	105	40	46	52	519	455	678	578	215	2,060
11	154	292	100	42	46	54	502	420	755	460	204	1,960
12	159	288	100	42	44	54	486	384	846	389	187	1,850
13	151	281	100	44	44	54	825	353	762	348	170	1,810
14	143	270	100	44	44	54	1,260	344	748	362	153	1,750
15	140	225	100	44	44	58	1,570	450	720	402	140	1,460
16	137	182	100	44	44	64	1,500	713	620	380	142	1,140
17	137	210	105	44	44	100	1,550	1,150	548	348	133	848
18	134	210	105	44	44	180	1,750	1,190	508	311	124	628
19	126	180	110	44	44	300	1,630	1,150	497	281	157	544
20	117	140	110	44	44	410	1,480	1,110	480	270	353	582
21	115	160	110	44	44	350	1,630	1,020	685	398	474	581
22	112	170	110	44	44	300	1,590	874	1,110	664	453	543
23	109	160	105	44	44	250	1,560	741	1,220	657	418	523
24	117	150	96	46	44	210	1,670	727	1,220	614	347	500
25	455	130	90	46	44	230	1,640	692	1,180	524	294	459
26	727	110	84	46	44	280	1,520	657	783	416	253	429
27	804	91	78	46	44	400	1,380	867	1,710	440	221	405
28	818	86	72	48	44	560	1,200	1,390	1,940	470	195	376
29	797	96	68	48	44	700	1,030	1,580	1,750	470	175	344
30	811	110	62	50	------	881	888	1,550	1,970	486	158	319
31	818	------	58	50	------	916	------	1,430	------	508	144	------
TOTAL	7,705	8,587	3,098	1,392	1,326	6,881	32,365	25,014	29,908	24,588	7,908	28,214
MEAN	249	286	99.9	44.9	45.7	222	1,079	807	997	793	255	940
MAX	818	762	125	54	50	916	1,750	1,580	1,970	2,540	480	2,060
MIN	48	86	58	40	44	44	486	344	480	270	124	191
CFSM	.55	.64	.22	.10	.10	.49	2.40	1.79	2.22	1.76	.57	2.09
IN.	.64	.71	.26	.12	.11	.57	2.67	2.07	2.47	2.03	.65	2.33

CAL YR 1967: TOTAL 136,375 MEAN 374 MAX 3,100 MIN 34 CFSM .83 IN 11.27
WAT YR 1968: TOTAL 176,986 MEAN 484 MAX 2,540 MIN 40 CFSM 1.07 IN 14.63

4-0605. Iron River at Caspian, Mich.

Location.—Lat 46°03'31", long 88°37'38", on line between SE ¼ and SW ¼ sec. 1, T.42 N., R.35 W., on downstream side of highway bridge in Caspian, 5.0 (revised) miles upstream from mouth.

Drainage area.—92.1 sq mi.

Records available.—March 1948 to September 1968.

Gage.—Wire-weight gage, read twice daily, and crest-stage gage. Datum of gage is 1,438.78 ft above mean sea level, datum of 1929.

Average discharge.—20 years, 82.0 cfs.

Extremes.—Maximum discharge during year, 307 cfs July 1 (gage height, 6.62 ft); minimum, 55 cfs Nov. 27 (gage height, 3.85 ft).
1948-68: Maximum discharge, 1,430 cfs July 2, 1953 (gage height, 10.20 ft); minimum observed, 29 cfs Mar. 13, 1954 (gage height, 3.41 ft).

Remarks.—Records good except those for winter months, which are fair. The average flow includes mine pumpage and sewage plant effluent. Pumpage rates have diminished over the years due to the closing of most mines.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	62	107	72	60	63	63	96	100	133	290	72	92
2	65	100	74	60	63	63	104	96	130	246	72	84
3	64	96	74	60	62	68	104	94	114	171	70	75
4	63	91	71	60	62	65	108	96	104	133	69	72
5	65	89	71	59	62	65	98	91	94	100	65	137
6	63	86	72	59	62	65	94	90	108	109	67	110
7	64	83	73	58	62	72	92	86	101	104	67	96
8	135	80	73	57	63	71	95	83	90	101	65	100
9	114	83	68	57	63	72	92	77	189	97	65	191
10	99	80	71	58	63	71	89	77	176	91	65	194
11	91	79	72	59	63	68	87	75	173	91	65	149
12	80	81	72	60	63	79	88	74	171	128	64	117
13	82	78	72	60	62	70	102	74	137	122	65	100
14	83	80	65	61	62	67	126	74	124	141	63	92
15	80	76	61	62	62	80	156	91	108	123	62	86
16	80	78	70	62	63	88	142	88	99	124	67	81
17	80	77	71	62	63	100	132	86	96	108	65	80
18	75	78	71	63	63	132	126	80	92	153	63	86
19	77	78	70	63	63	182	115	76	104	138	65	91
20	75	76	68	63	62	167	136	74	91	114	83	89
21	74	77	68	63	61	110	150	72	133	146	72	86
22	72	76	68	63	60	84	142	72	132	108	72	81
23	74	74	67	62	60	80	132	104	133	94	70	84
24	90	74	67	61	60	74	143	123	121	92	68	102
25	196	77	65	60	61	80	135	105	109	86	64	94
26	203	77	62	60	63	84	132	92	108	91	63	83
27	156	68	59	60	64	96	121	108	198	88	62	79
28	126	65	57	60	63	187	114	139	227	80	61	74
29	114	68	57	61	65	186	108	142	187	80	62	75
30	122	73	58	62	------	140	104	93	234	80	60	75
31	116	------	60	62	------	138	------	110	------	81	62	------
TOTAL	2,940	2,405	2,099	1,877	1,808	2,967	3,463	2,842	4,016	3,710	2,055	2,955
MEAN	94.8	80.2	67.7	60.5	62.3	95.7	115	91.7	134	120	66.3	98.5
MAX	203	107	74	63	65	187	156	142	234	290	83	194
MIN	62	65	57	57	60	63	87	72	90	80	60	72

CAL YR 1967: TOTAL 36,674 MEAN 100 MAX 612 MIN 52
WAT YR 1968: TOTAL 33,137 MEAN 90.5 MAX 290 MIN 57

4-0610. Brule River near Florence, Wis.

Location.--Lat 45°57'31", long 88°15'57", in SE 1/4 SE 1/4 sec.11, T.41 N., R.32 W., Michigan meridian, on left bank 40 ft upstream from highway bridge, 1 mile upstream from Paint River, 2.5 miles north of Florence, and 5 miles upstream from confluence with Michigamme River.

Drainage area.--389 sq mi.

Records available.--January 1914 to February 1916, June 1944 to September 1968.

Gage.--Digital water-stage recorder. Altitude of gage is 1,210 ft (from topographic map). Prior to Aug. 29, 1944, wire-weight or chain gages at bridge 40 ft downstream at present datum. Aug. 29, 1944, to Sept. 29, 1966, graphic water-stage recorder at present site and datum.

Average discharge.--25 years (1914-15, 1944-68), 349 cfs.

Extremes.--Maximum discharge during year, 1,640 cfs July 1 (gage height, 4.03 ft); maximum gage height, 7.05 ft Dec. 28 (ice jam); minimum daily discharge, 200 cfs Dec. 15, 29-31, Jan. 1.
1914-16, 1944-68: Maximum discharge, 4,700 cfs July 2, 1953 (gage height, 6.57 ft); maximum gage height, 8.01 ft Jan. 8, 1960 (ice jam); minimum discharge, 118 cfs Dec. 2, 1963 (discharge measurement); minimum gage height, 1.79 ft July 24, 1964.

Remarks.--Records good except those for winter months, which are fair. Discharge includes mine pumpage (see sta. no. 605).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	255	473	290	200	260	240	557	403	611	1,630	407	424
2	251	440	300	210	255	240	491	383	664	1,450	377	463
3	255	414	300	220	250	240	454	379	582	1,090	353	392
4	251	392	290	225	250	240	458	396	510	847	339	372
5	251	373	285	225	245	240	428	378	459	701	331	662
6	251	349	280	225	240	245	410	358	432	602	331	621
7	259	344	280	225	240	250	389	343	490	544	331	520
8	462	335	280	225	240	255	391	332	409	512	325	519
9	586	339	280	225	235	260	398	322	809	484	319	933
10	501	335	280	215	235	260	389	325	961	454	311	1,110
11	424	335	280	210	235	255	372	318	813	429	301	859
12	377	339	270	210	230	250	370	313	755	481	295	663
13	368	335	250	210	230	245	436	307	666	534	295	544
14	387	330	220	210	230	240	505	314	601	625	289	483
15	368	340	200	210	230	245	630	380	553	656	285	439
16	353	340	220	215	225	260	596	447	488	573	295	405
17	335	353	240	220	225	300	562	461	452	518	295	385
18	326	317	260	220	220	350	550	405	440	605	290	405
19	326	313	245	225	220	520	520	364	491	717	314	450
20	317	310	230	230	220	540	517	343	440	619	440	450
21	308	310	250	230	220	510	674	333	569	600	374	436
22	299	320	245	230	220	460	639	323	742	606	352	404
23	295	304	235	230	220	400	583	385	660	523	335	395
24	326	304	230	235	220	370	650	622	605	478	315	410
25	731	299	225	240	225	360	610	545	540	444	297	430
26	864	295	220	245	230	370	548	460	522	422	293	430
27	717	270	215	250	240	407	507	543	816	472	287	410
28	586	245	205	260	240	670	470	665	975	436	281	370
29	501	250	200	270	240	768	442	755	843	399	276	354
30	517	260	200	270	------	643	422	669	1,210	390	275	346
31	512	------	200	265	------	603	------	577	------	422	275	------
TOTAL	12,559	9,963	7,705	7,080	6,770	11,236	14,968	13,148	19,198	19,263	9,883	15,084
MEAN	405	332	249	228	233	362	499	424	640	621	319	503
MAX	864	473	300	270	260	768	674	755	1,210	1,630	440	1,110
MIN	251	245	200	200	220	240	370	307	432	390	275	346
CFSM	1.04	.85	.64	.59	.60	.93	1.28	1.09	1.65	1.60	.82	1.29
IN.	1.20	.95	.74	.68	.65	1.07	1.43	1.26	1.84	1.84	.94	1.44

CAL YR 1967 TOTAL 152,456 MEAN 418 MAX 1,920 MIN 200 CFSM 1.07 IN 14.58
WTR YR 1968 TOTAL 146,857 MEAN 401 MAX 1,630 MIN 200 CFSM 1.03 IN 14.04

4-0615. Paint River at Crystal Falls, Mich.

Location.--Lat 46°06'21", long 88°20'05", in SE 1/4 sec.20, T.43 N., R.32 W., on right bank 150 ft downstream from municipal powerplant at Crystal Falls and 14.5 miles upstream from mouth.

Drainage area.--597 sq mi.

Records available.--August 1944 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 1,306.1 ft above mean sea level (Wisconsin-Michigan Power Co. bench mark). Prior to July 18, 1963, graphic water-stage recorder at present site and datum.

Average discharge.--24 years, 574 cfs.

Extremes.--Maximum discharge during year, 2,490 cfs Sept. 10 (gage height, 4.72 ft); minimum, 111 cfs Jan. 9 (gage height, 1.78 ft); minimum daily, 270 cfs Feb. 23, 24.
1944-68: Maximum discharge, 10,900 cfs Apr. 25, 1960 (gage height, 9.82 ft); minimum, 7.7 cfs Sept. 17, 1950 (gage height, 0.89 ft); minimum daily, 81 cfs Nov. 1, 1947.

Remarks.--Records good. Diurnal fluctuation caused by powerplant immediately above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	321	1,500	472	320	313	299	1,640	786	1,130	1,720	759	436
2	307	1,420	482	327	324	292	1,360	748	1,170	1,590	694	584
3	294	1,370	462	310	306	279	1,160	708	1,080	1,300	606	648
4	307	1,250	449	310	296	288	1,020	712	956	1,050	520	666
5	306	1,110	434	310	319	302	929	709	812	891	476	1,010
6	316	995	451	300	312	289	882	682	746	792	430	1,410
7	299	910	451	290	310	323	823	629	909	715	430	1,370
8	469	810	455	290	308	304	806	580	1,360	671	420	1,450
9	747	817	420	291	326	333	810	550	1,490	601	415	1,800
10	784	779	425	285	321	335	809	536	1,530	556	410	2,370
11	751	767	445	313	303	344	786	520	1,510	504	379	2,410
12	711	763	451	324	310	329	769	500	1,750	544	356	2,170
13	683	753	415	322	290	288	809	475	1,670	587	344	1,800
14	690	754	356	326	295	296	897	464	1,480	636	352	1,480
15	695	699	346	332	300	296	1,300	510	1,310	699	352	1,170
16	825	653	374	307	310	339	1,410	604	1,100	699	346	948
17	868	732	417	325	310	388	1,350	668	924	671	338	830
18	815	706	442	319	285	486	1,310	697	833	776	341	773
19	821	664	405	312	310	714	1,250	676	796	1,000	378	755
20	790	494	381	320	300	948	1,110	611	755	886	383	745
21	749	583	435	316	295	913	1,250	571	774	806	440	724
22	731	647	406	322	280	753	1,380	530	957	790	412	689
23	707	576	374	322	270	672	1,290	567	1,080	706	425	626
24	698	577	370	311	270	609	1,290	899	1,330	608	434	675
25	1,250	565	380	295	275	601	1,280	1,110	1,300	538	420	740
26	2,030	545	375	290	285	646	1,160	979	1,150	492	404	709
27	2,010	399	342	303	294	743	1,070	947	1,490	544	389	641
28	1,810	391	339	278	290	1,270	979	1,070	1,840	790	367	569
29	1,560	396	337	339	283	1,970	911	1,380	1,600	790	346	538
30	1,490	456	324	301	------	1,940	846	1,360	1,480	798	333	506
31	1,550	------	356	313	------	1,860	------	1,200	------	798	320	------
TOTAL	26,384	23,081	12,571	9,623	8,690	19,449	32,686	22,978	36,312	24,548	13,019	31,242
MEAN	851	769	406	310	300	627	1,090	741	1,210	792	420	1,041
MAX	2,030	1,500	482	339	326	1,970	1,640	1,380	1,840	1,720	759	2,410
MIN	294	391	324	278	270	279	769	464	746	492	320	436
CFSM	1.43	1.29	.68	.52	.50	1.05	1.83	1.24	2.03	1.33	.70	1.74
IN.	1.64	1.44	.78	.60	.54	1.21	2.04	1.43	2.26	1.53	.81	1.95

CAL YR 1967 TOTAL 286,151 MEAN 784 MAX 4,760 MIN 257 CFSM 1.31 IN 17.83
WTR YR 1968 TOTAL 260,583 MEAN 712 MAX 2,410 MIN 270 CFSM 1.19 IN 16.23

4-0620. Paint River near Alpha, Mich.

Location.--Lat 46°00'40", long 88°15'30", in NW 1/4 NW 1/4 sec.25, T.42 N., R.32 W., on right bank 0.6 mile downstream from Lower Paint Dam, 5.5 miles upstream from Brule River, and 6 miles southeast of Alpha.

Drainage area.--631 sq mi.

Records available.--June 1952 to September 1968. Monthly discharge only for period October 1953 to September 1960, published in WSP 1727.

Gage.--Digital water-stage recorder. Altitude of gage is 1,260 ft (from topographic map). Prior to Sept. 29, 1966, graphic water-stage recorder at present site and datum.

Average discharge.--16 years, 164 cfs.

Extremes.--Maximum discharge during year, 1,180 cfs July 12-14 (gage height, 4.94 ft); minimum daily, 86 cfs Nov. 27, 28, Sept. 22-30; minimum gage height, 2.79 ft Mar. 30, Apr. 29.
1952-68: Maximum discharge, 8,050 cfs July 2, 1953 (gage height, 10.50 ft); minimum daily, 62 cfs Mar. 22, 1963.

Remarks.--Records good. Flow completely regulated by powerplant and Lower Paint Dam above station. Records not adjusted for diversion to Michigamme River by Paint River diversion canal.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	90	425	90	90	90	95	93	90	94	708	93	90
2	106	88	90	90	90	95	92	90	93	703	93	90
3	90	88	90	90	90	95	90	91	93	344	93	90
4	90	88	90	90	90	95	90	90	93	96	93	95
5	88	88	90	90	90	95	98	90	93	95	93	97
6	88	88	90	90	90	95	93	90	93	95	90	93
7	88	88	90	90	90	95	91	90	93	95	90	93
8	90	93	90	90	90	95	92	96	95	95	90	95
9	90	90	90	90	90	95	90	97	378	95	90	.565
10	90	90	90	90	90	95	90	90	647	95	90	947
11	88	90	90	90	90	95	91	90	645	95	90	954
12	88	90	90	90	90	95	91	90	946	95	93	933
13	90	90	90	90	90	95	91	90	1,180	95	93	919
14	90	90	90	90	90	95	93	91	934	95	93	898
15	90	90	87	90	90	95	93	90	374	95	93	807
16	90	90	87	90	90	95	93	94	94	95	90	90
17	90	90	90	90	90	95	93	94	93	95	90	88
18	90	90	90	90	90	95	93	93	93	95	90	88
19	90	95	90	90	90	96	93	93	92	95	93	88
20	90	95	90	90	90	98	93	92	93	95	90	88
21	88	95	90	90	95	132	95	92	384	97	90	88
22	88	93	90	90	95	148	94	93	688	95	90	86
23	88	93	90	90	95	129	94	93	106	95	90	86
24	90	93	90	90	95	102	93	93	242	95	90	86
25	93	93	90	90	95	93	93	93	654	95	90	86
26	97	92	90	90	95	94	93	93	446	96	90	86
27	111	86	87	90	95	93	93	95	707	97	90	86
28	95	86	87	90	95	95	93	96	719	97	90	86
29	90	88	87	90	95	96	92	95	702	97	90	86
30	395	90	87	90	------	98	91	94	713	97	90	86
31	664	------	87	90	------	94	------	93	------	98	90	------
TOTAL	3,705	3,045	2,769	2,790	2,655	3,078	2,774	2,861	11,677	4,430	2,820	8,070
MEAN	120	102	89.3	90.0	91.6	99.3	92.5	92.3	389	143	91.0	269
MAX	664	425	90	90	95	148	98	97	1,180	708	93	954
MIN	88	86	87	90	90	93	90	90	92	95	90	86

CAL YR 1967 TOTAL 78,832 MEAN 216 MAX 3,340 MIN 84
WTR YR 1968 TOTAL 50,674 MEAN 138 MAX 1,180 MIN 86

4-0621. Peshekee River near Michigamme, Mich.

Location.--Lat 46°34'55", long 87°59'51", in SE 1/4 sec.1, T.48 N., R.30 W., on right bank 10 ft downstream from bridge on county highway, 0.2 mile downstream from Dishno Creek, 5 miles north of Champion, and 6 miles northeast of Michigamme.

Drainage area.--66.5 sq mi.

Records available.--July 1961 to September 1968 (discontinued).

Gage.--Water-stage recorder. Datum of gage is 1,598.01 ft above mean sea level, datum of 1929. Prior to Aug. 11, 1961, wire-weight gage at present site and datum.

Average discharge.--7 years, 115 cfs.

Extremes.--Maximum discharge during year, 1,340 cfs Mar. 29 (gage height, 9.08 ft); minimum, 7.1 cfs Oct. 5, 7 (gage height, 3.48 ft).
1961-68: Maximum discharge, 3,060 cfs May 8, 1965 (gage height, 11.46 ft); minimum, 3.6 cfs Sept. 1, 1961 (gage height, 3.21 ft).

Remarks.--Records good except those for winter months, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	9.1	318	63	35	23	20	641	160	123	183	111	71
2	8.4	296	62	33	24	19	524	136	113	146	91	188
3	8.2	310	60	32	25	19	382	125	104	123	74	183
4	7.7	274	59	30	25	20	345	128	91	104	60	180
5	7.3	220	58	30	26	20	304	117	80	88	51	542
6	7.5	186	57	29	27	21	284	102	132	76	47	700
7	8.2	159	57	28	28	21	272	90	348	66	43	479
8	46	142	57	27	29	22	240	80	338	58	39	395
9	102	134	55	26	29	23	435	75	220	84	36	672
10	138	134	53	25	30	25	412	73	153	116	33	1,120
11	130	176	52	25	31	27	322	70	141	92	28	896
12	108	252	51	24	30	29	304	65	160	73	25	479
13	125	282	50	24	30	31	405	60	180	67	25	288
14	191	234	47	23	29	34	465	58	166	92	22	197
15	206	186	45	23	28	38	509	67	140	132	20	152
16	172	184	45	22	28	43	438	94	113	476	20	123
17	126	146	44	22	27	50	335	167	106	584	18	102
18	146	125	42	22	27	70	294	169	107	662	17	88
19	244	115	41	22	26	90	248	136	122	395	16	81
20	206	110	40	21	25	120	213	117	99	236	16	85
21	188	105	50	21	24	190	246	107	110	184	18	81
22	175	100	65	21	23	300	230	93	160	169	25	75
23	146	90	80	21	23	340	204	126	163	152	45	92
24	141	85	70	21	22	310	211	164	150	114	83	135
25	408	80	60	21	21	260	215	155	122	92	76	132
26	683	76	55	21	21	230	199	126	100	81	84	114
27	494	72	50	21	20	350	206	149	146	200	75	98
28	300	70	45	22	20	683	207	188	250	340	58	84
29	220	65	42	22	20	1,100	207	202	260	242	45	75
30	282	63	39	22	------	1,100	192	173	211	152	36	67
31	345	------	37	23	------	956	------	140	------	126	29	------
TOTAL	5,378.4	4,789	1,631	759	741	6,561	9,589	3,712	4,708	5,705	1,366	7,974
MEAN	173	160	52.6	24.5	25.6	212	320	120	157	184	44.1	266
MAX	683	318	80	35	31	1,100	641	202	348	662	111	1,120
MIN	7.3	63	37	21	20	19	192	58	80	58	16	67
CFSM	2.61	2.40	.79	.37	.38	3.18	4.81	1.80	2.36	2.77	.66	4.00
IN.	3.01	2.68	.91	.42	.41	3.67	5.36	2.08	2.63	3.19	.76	4.46

CAL YR 1967: TOTAL 48,792.5 MEAN 134 MAX 1,600 MIN 6.1 CFSM 2.01 IN 27.29
WAT YR 1968: TOTAL 52,913.4 MEAN 145 MAX 1,120 MIN 7.3 CFSM 2.17 IN 29.59

PEAK DISCHARGE (BASE, 350 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
10-26	1600	7.60	725	07-18	1100	7.67	750
03-29	1100	9.08	1,340	07-28	1400	6.37	362
04-15	1300	6.97	521	09-10	1300	8.65	1,140
06-07	1800	6.54	405				

4-0622. Peshekee River near Champion, Mich.

Location.--Lat 46°33'25", long 88°00'09°, in NW 1/4 sec.13, T.48 N., R.30 W., on left bank 10 ft downstream from bridge on county highway, 0.6 mile downstream from West Branch, and 3.5 miles northwest of Champion.

Drainage area.--133 sq mi.

Records available.--July 1961 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 1,577.49 ft above mean sea level, datum of 1929. Prior to Aug. 15, 1961, wire-weight gage at same site and datum.

Average discharge.--7 years, 212 cfs.

Extremes.--Maximum discharge during year, 1,920 cfs Mar. 30 (gage height, 5.76 ft); maximum gage height, 7.02 ft Mar. 28 (backwater from ice); minimum discharge, 13 cfs Oct. 5-7 (gage height, 1.42 ft).
1961-68: Maximum discharge, 3,610 cfs May 8, 1965 (gage height, 8.01 ft); minimum, 4.2 cfs Sept. 10, 1961 (gage height, 1.24 ft).

Remarks.--Records good except those for winter months or those below 40 cfs, which are fair. Records of water temperatures for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	17	625	140	58	38	32	1,260	317	287	335	222	140
2	16	600	135	55	39	32	1,040	275	263	284	190	335
3	16	605	130	51	40	33	818	251	257	239	155	338
4	15	540	125	48	42	33	725	251	212	202	129	338
5	13	468	120	46	43	34	610	230	188	175	109	920
6	13	406	120	45	45	35	590	205	275	147	95	1,150
7	13	354	115	43	46	36	550	185	570	129	88	976
8	66	332	115	42	47	38	620	165	540	109	82	866
9	178	296	110	41	47	40	730	155	382	131	75	1,410
10	233	284	110	40	48	42	740	151	296	170	67	1,820
11	225	329	105	40	48	44	645	145	275	145	59	1,630
12	200	424	100	39	48	45	590	133	305	123	54	1,150
13	228	488	96	38	47	48	675	123	332	113	51	770
14	314	452	95	37	47	52	776	115	382	151	46	550
15	347	374	92	37	46	58	872	131	293	202	41	424
16	326	405	88	36	45	65	830	178	242	730	43	335
17	248	313	86	36	44	80	705	302	222	914	36	272
18	266	266	84	35	43	95	620	314	220	1,190	32	233
19	399	248	82	35	42	130	528	263	248	878	30	210
20	364	220	80	35	40	160	472	228	212	575	29	205
21	341	210	90	35	38	220	500	208	230	440	32	192
22	326	200	120	35	38	350	472	185	311	378	48	172
23	287	200	140	35	37	540	436	242	326	320	92	198
24	278	190	130	35	36	500	440	320	314	248	200	275
25	650	180	115	35	35	450	436	323	269	202	168	278
26	997	170	100	35	35	370	410	290	225	175	170	245
27	890	160	90	35	34	450	413	329	299	320	153	215
28	675	160	80	35	33	800	402	396	420	508	129	190
29	520	155	75	35	32	1,400	396	424	424	420	101	170
30	580	150	70	36	------	1,820	364	392	378	308	80	149
31	650	------	62	36	------	1,650	------	332	------	251	66	------
TOTAL	9,691	9,804	3,200	1,224	1,203	9,682	18,665	7,558	9,197	10,512	2,872	16,156
MEAN	313	327	103	39.5	41.5	312	622	244	307	339	92.6	539
MAX	997	625	140	58	48	1,820	1,260	424	570	1,190	222	1,820
MIN	13	150	62	35	32	32	364	115	188	109	29	140
CFSM	2.35	2.46	.78	.30	.31	2.35	4.68	1.83	2.31	2.55	.70	4.05
IN.	2.71	2.74	.89	.34	.34	2.71	5.22	2.11	2.57	2.94	.80	4.52

CAL YR 1967: TOTAL 93,625 MEAN 257 MAX 2,620 MIN 13 CFSM 1.93 IN 26.18
WAT YR 1968: TOTAL 99,764 MEAN 273 MAX 1,820 MIN 13 CFSM 2.05 IN 27.90

PEAK DISCHARGE (BASE, 600 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
10-26	1800	4.60	1,060	06-07	1800	3.89	635
03-30	1700	5.76	1,920	07-18	1100	4.92	1,290
04-15	1200	4.35	890	09-10	1200	5.65	1,840

4-0622.7. Michigamme River near Champion, Mich.

Location.--Lat 46°26'38", long 88°02'59", in SW 1/4 NW 1/4 sec.27, T.47 N., R.30 W., on right bank, 1.5 miles downstream from Spruce River, 4.5 miles northwest of Republic, and 6.5 miles southwest of Champion.

Drainage area.--231 sq mi.

Records available.--July 1964 to September 1968.

Gage.-- Chain gage read once daily. Altitude of gage is 1,500 ft (from topographic map). Prior to July 7, 1966, staff gage at present site and datum.

Extremes.--Maximum discharge during year, 1,450 cfs Sept. 12 (gage height, 4.60 ft); minimum, 52 cfs Oct. 6, 7 (gage height, 1.08 ft).
1964-68: Maximum discharge, 3,770 cfs May 10, 1965 (gage height, 6.75 ft); minimum, 48 cfs Sept. 13, 1965 (gage height, 1.06 ft); minimum gage height, 1.05 ft Sept. 25, 26, 1967.

Remarks.--Records good except those for winter months, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	62	810	289	150	110	82	1,240	600	546	565	470	200
2	60	810	282	150	110	82	1,260	550	530	555	438	239
3	59	810	269	145	110	82	1,220	526	522	510	406	254
4	57	805	263	145	110	82	1,200	506	482	482	374	275
5	56	775	251	140	105	82	1,130	470	458	450	342	470
6	52	735	239	140	105	82	1,060	450	498	418	326	575
7	52	670	235	135	105	82	1,010	426	625	386	303	760
8	100	610	230	135	105	82	970	402	770	362	289	970
9	104	580	218	135	105	82	960	386	765	354	275	1,140
10	100	540	215	130	100	84	955	360	720	330	257	1,340
11	100	526	212	130	100	84	940	346	750	314	245	1,430
12	102	534	207	130	100	84	900	330	760	306	230	1,450
13	102	534	196	130	100	86	900	310	700	300	210	1,380
14	122	560	202	125	100	88	940	300	625	314	193	1,270
15	168	546	191	125	98	90	990	310	615	322	183	1,150
16	188	518	185	120	96	94	1,000	320	575	350	178	1,040
17	188	518	180	120	94	105	1,010	340	530	426	183	920
18	210	506	175	120	92	118	990	366	494	575	160	820
19	239	478	171	120	92	138	960	362	486	725	158	710
20	257	460	163	115	90	168	900	354	454	740	163	625
21	278	438	171	115	88	158	900	340	466	730	171	546
22	292	422	160	115	86	158	880	330	514	675	168	510
23	303	410	160	115	86	173	830	354	530	620	173	470
24	342	390	160	115	84	183	830	402	530	560	178	490
25	478	370	160	115	84	204	790	410	514	502	180	470
26	580	358	160	115	84	239	760	430	482	454	178	454
27	685	334	160	115	84	282	720	458	522	534	173	430
28	725	318	160	115	84	434	690	522	530	526	173	406
29	740	303	160	115	82	615	660	585	530	510	173	390
30	765	296	155	115	------	885	630	555	546	506	178	362
31	800	------	155	115	------	1,160	------	538	------	502	165	------
TOTAL	8,366	15,964	6,134	3,905	2,789	6,368	28,225	12,938	17,069	14,903	7,293	21,546
MEAN	270	532	198	126	96.2	205	941	417	569	481	235	718
MAX	800	810	289	150	110	1,160	1,260	600	770	740	470	1,450
MIN	52	296	155	115	82	82	630	300	454	300	158	200
CFSM	1.17	2.30	.86	.55	.42	.89	4.07	1.81	2.46	2.08	1.02	3.11
IN.	1.35	2.57	.99	.63	.45	1.03	4.54	2.08	2.75	2.40	1.17	3.47

CAL YR 1967: TOTAL 141,852 MEAN 389 MAX 2,620 MIN 52 CFSM 1.68 IN 22.84
WAT YR 1968: TOTAL 145,500 MEAN 398 MAX 1,450 MIN 52 CFSM 1.72 IN 23.42

4-0623. Michigamme River at Republic, Mich.

Location.--Lat 46°23'03", long 87°58'48", in SE 1/4 sec.18, T.46 N., R.29 W., on left bank 400 ft upstream from county highway bridge, 0.3 mile upstream from Trout Falls Creek, and 0.6 mile south of Republic.

Drainage area.--240 sq mi.

Records available.--July 1961 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 1,480 ft (from topographic map).

Average discharge.--7 years, 308 cfs.

Extremes.--Maximum discharge during year, 1,540 cfs Sept. 9 (gage height, 4.66 ft); minimum, 27 cfs Oct. 1 (gage height, 0.39 ft).
1961-68: Maximum discharge, 3,950 cfs May 10, 1965 (gage height, 8.17 ft); minimum, 7.0 cfs Mar. 26-28, 1964; minimum daily, 7.7 cfs Mar. 26-29, 1964.

Remarks.--Records good except those for winter months, which are fair. Prior to June 1, 1963, diurnal fluctuation caused by power plant 0.4 mile above station; power plant abandoned and only occasional regulation since. Since June 1, 1963, water diverted 0.5 mile above station for industrial use and returned to river by Gambles Creek, 5 miles downstream. Records are not adjusted for diversion.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	29	760	293	165	90	70	1,220	532	529	554	481	202
2	29	745	291	160	90	70	1,310	550	538	574	469	405
3	29	750	288	155	85	70	1,260	544	541	554	438	355
4	37	750	286	150	85	70	1,240	526	505	466	378	258
5	45	745	265	145	80	70	1,200	478	452	420	330	303
6	45	730	233	140	80	70	1,100	428	458	418	318	594
7	45	482	226	140	75	70	1,050	380	554	400	293	694
8	47	622	219	135	75	70	985	380	634	378	293	810
9	73	558	210	135	75	70	965	380	990	368	293	1,270
10	104	475	195	130	75	70	970	380	930	332	288	1,520
11	99	475	195	130	75	75	965	378	810	303	258	1,530
12	97	478	195	125	75	75	940	358	890	305	235	1,520
13	97	481	190	118	75	75	930	281	775	308	208	1,490
14	100	496	180	118	75	75	935	284	634	310	163	1,330
15	104	514	170	118	75	75	985	291	626	318	149	1,240
16	118	511	163	118	70	78	1,080	350	570	375	151	1,110
17	181	508	165	116	70	80	1,080	430	511	388	151	965
18	224	499	167	120	70	83	1,040	375	508	547	153	900
19	252	490	179	130	70	115	975	358	499	678	159	706
20	217	450	163	120	70	193	960	378	452	682	167	582
21	238	405	161	110	70	213	965	372	428	760	169	558
22	256	405	167	95	70	208	915	358	481	674	169	493
23	256	405	163	85	70	199	850	340	590	570	169	460
24	279	368	163	80	70	193	850	362	602	566	169	466
25	493	312	163	81	70	195	840	392	562	514	167	484
26	630	318	165	83	70	199	775	392	547	442	167	475
27	618	320	165	85	70	240	690	442	526	566	155	466
28	614	312	169	90	70	410	686	558	570	654	123	430
29	715	293	171	90	70	626	670	610	562	529	125	370
30	810	293	171	95	------	985	550	535	550	484	125	332
31	795	------	170	95	------	1,080	------	532	------	484	127	------
TOTAL	7,676	15,150	6,101	3,657	2,165	6,172	28,981	12,954	17,824	14,921	7,040	22,318
MEAN	248	505	197	118	74.7	199	966	418	594	481	227	744
MAX	810	760	293	165	90	1,080	1,310	610	990	760	481	1,530
MIN	29	293	161	80	70	70	550	281	428	303	123	202

CAL YR 1967: TOTAL 139,634 MEAN 383 MAX 2,890 MIN 27
WAT YR 1968: TOTAL 144,959 MEAN 396 MAX 1,530 MIN 29

4-0624. Michigamme River near Witch Lake, Mich.

Location.--Lat 46°14'48", long 88°00'45", in NW¼ NW¼ sec. 1, T.44 N., R.30 W., on left bank, 20 ft upstream from bridge on county highway, 0.4 miles upstream from Witch Lake Outlet, and 2.0 miles south of Witch Lake.

Drainage area.--316 sq mi.

Records available.--August 1964 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 1,380 ft (from topographic map).

Extremes.--Maximum discharge during year, 1,730 cfs Sept. 10 (gage height, 6.90 ft); minimum, 77 cfs Oct. 4 (gage height, 2.37 ft). 1964-68: Maximum discharge, 4,360 cfs May 11, 1965 (gage height, 11.60 ft); minimum, 46 cfs Aug. 14, 1965 (gage height, 2.17 ft).

Remarks.--Records good except those for winter months or those below 500 cfs which are fair, Occasional regulation caused by dam 14 miles above station. Some flow diverted and returned above station by iron ore processing plant. Records of water temperatures, chemical analyses, and suspended sediment loads for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	82	962	340	200	125	100	1,270	690	722	786	642	198
2	82	918	330	190	125	100	1,420	710	722	770	618	482
3	80	910	320	180	125	100	1,390	718	722	774	598	502
4	79	910	310	180	120	100	1,360	718	702	690	502	434
5	82	898	300	170	120	100	1,340	658	602	574	438	422
6	91	886	300	160	120	100	1,290	602	602	558	410	722
7	95	862	290	160	120	100	1,190	506	698	542	366	902
8	134	778	280	160	120	100	1,160	494	730	494	355	946
9	166	758	270	150	120	100	1,100	494	962	490	355	1,290
10	194	626	260	150	120	100	1,100	490	1,160	458	348	1,710
11	194	618	260	150	115	100	1,100	486	970	394	330	1,700
12	183	622	268	150	115	100	1,090	478	1,020	390	274	1,660
13	181	622	260	145	115	100	1,100	386	1,010	390	268	1,620
14	185	626	250	145	115	105	1,110	366	834	406	223	1,550
15	192	646	240	145	115	110	1,150	376	798	410	194	1,360
16	196	654	230	140	110	120	1,190	446	770	450	194	1,290
17	235	650	229	140	110	140	1,260	598	686	482	201	1,110
18	299	642	232	140	110	170	1,220	582	674	630	203	1,070
19	358	630	247	140	105	200	1,170	494	666	802	210	954
20	334	650	238	140	105	260	1,120	518	634	822	244	774
21	327	570	235	135	105	300	1,150	510	590	846	238	750
22	348	522	232	135	105	310	1,140	494	654	898	232	670
23	348	514	230	130	105	300	1,040	474	810	710	229	622
24	366	506	220	130	100	280	1,040	478	846	694	226	618
25	614	414	220	130	100	280	1,040	522	818	678	220	630
26	874	398	220	130	100	296	1,010	522	738	566	213	634
27	858	390	220	130	100	344	898	586	762	722	208	618
28	826	380	220	130	100	534	870	702	814	918	178	598
29	838	360	210	130	100	794	846	878	810	774	168	494
30	998	350	210	130	------	1,020	782	754	786	666	168	470
31	986	------	200	125	------	1,220	------	726	------	646	166	------
TOTAL	10,825	19,272	7,871	4,570	3,245	8,083	33,946	17,456	23,312	19,430	9,219	26,800
MEAN	349	642	254	147	112	261	1,132	563	777	627	297	893
MAX	998	962	340	200	125	1,220	1,420	878	1,160	918	642	1,710
MIN	79	350	200	125	100	100	782	366	590	390	166	198
CFSM	1.11	2.03	.80	.47	.35	.83	3.58	1.78	2.46	1.98	.94	2.83
IN.	1.27	2.27	.93	.54	.38	.95	4.00	2.05	2.74	2.29	1.08	3.15

CAL YR 1967: TOTAL 177,644 MEAN 487 MAX 3,280 MIN 77 CFSM 1.54 IN 20.91
WAT YR 1968: TOTAL 184,029 MEAN 503 MAX 1,710 MIN 79 CFSM 1.59 IN 21.66

4-0625. Michigamme River near Crystal Falls, Mich.

Location.--Lat 46°06'50", long 88°12'57", in NW 1/4 sec.20, T.43 N., R.31 W., on right bank 400 ft upstream from highway bridge, 5 miles downstream from Michigamme Reservoir, 6 miles east of Crystal Falls, and 15 miles upstream from confluence with Brule River.

Drainage area.--656 sq mi.

Records available.--August 1944 to September 1968.

Gage.--Digital water-stage recorder. Altitude of gage is 1,300 ft (from topographic map). Prior to July 18, 1963, graphic water-stage recorder at present site and datum.

Average discharge.--24 years, 683 cfs.

Extremes.--Maximum discharge during year, 3,100 cfs Sept. 11 (gage height, 7.39 ft); minimum, 78 cfs Mar. 25 (gage height, 1.46 ft); minimum daily, 80 cfs Mar. 25.
1944-68: Maximum discharge, 7,260 cfs Apr. 28, 1960 (gage height, 10.73 ft); minimum daily, 71 cfs Nov. 26, 1950.

Remarks.--Records good. Flow regulated by powerplant and by Michigamme Reservoir (capacity, 119,950 acre-ft) 5 miles above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	154	986	625	594	656	634	94	1,150	727	1,680	1,170	144
2	484	654	966	590	655	552	85	883	763	1,420	1,170	138
3	636	870	1,190	590	652	552	83	711	756	1,200	1,170	136
4	634	1,180	942	586	651	669	86	713	751	1,180	1,160	146
5	632	1,180	619	761	920	736	83	711	746	1,160	1,160	577
6	467	1,180	619	793	1,100	652	83	709	829	879	1,160	763
7	141	1,180	621	582	1,000	585	83	707	1,180	662	907	751
8	158	1,180	621	582	591	573	395	662	1,170	649	730	991
9	150	1,180	620	833	891	571	605	633	1,350	652	729	2,010
10	147	1,180	621	1,120	1,100	564	605	633	1,570	651	728	3,070
11	147	1,170	621	606	1,090	555	607	321	1,860	651	728	2,700
12	141	1,170	620	598	1,080	562	612	148	2,010	653	436	1,740
13	130	1,170	619	574	1,080	557	621	279	1,760	653	321	2,010
14	129	1,170	622	562	1,070	532	638	631	1,390	661	724	2,580
15	129	1,170	858	870	1,060	442	644	637	886	659	694	2,250
16	129	1,170	884	830	1,040	416	643	662	656	655	727	1,460
17	141	1,170	645	582	1,080	629	647	401	966	654	353	1,200
18	132	1,170	983	585	1,050	624	644	171	1,200	921	158	1,420
19	128	1,120	1,210	583	1,040	109	643	165	1,170	1,150	520	1,600
20	130	1,120	1,200	475	1,070	100	649	495	1,170	872	732	1,600
21	128	1,210	1,200	145	1,090	86	667	614	1,190	943	726	1,590
22	132	1,210	1,060	572	1,070	82	666	649	1,200	1,160	635	1,580
23	461	1,200	613	572	988	82	936	652	1,200	1,150	723	1,420
24	641	1,200	614	573	660	82	1,230	377	1,270	1,150	718	1,240
25	135	1,200	612	574	578	80	1,170	148	1,560	1,150	719	1,160
26	402	1,180	938	466	864	81	1,170	146	1,410	1,030	730	1,160
27	667	1,180	1,190	577	1,040	87	1,160	492	1,600	657	719	1,150
28	660	1,170	1,190	575	866	99	1,170	687	1,610	655	729	1,150
29	665	900	1,100	618	757	98	1,160	691	1,380	954	714	1,150
30	887	623	598	647	------	94	1,160	684	1,450	1,170	520	860
31	1,230	------	594	654	------	98	------	675	------	1,180	130	------
TOTAL	10,947	33,443	25,415	19,269	26,789	11,583	19,039	17,237	36,780	28,861	22,540	39,746
MEAN	353	1,115	820	622	924	374	635	556	1,226	931	727	1,325
MAX	1,230	1,210	1,210	1,120	1,100	736	1,230	1,150	2,010	1,680	1,170	3,070
MIN	128	623	594	145	578	80	83	146	656	649	130	136

CAL YR 1967 TOTAL 306,743 MEAN 840 MAX 4,290 MIN 108
WTR YR 1968 TOTAL 291,649 MEAN 797 MAX 3,070 MIN 80

4-0630. Menominee River near Florence, Wis.

Location.--Lat 45°57'04", long 88°11'13", in NE 1/4 sec.16, T.41 N., R.31 W., Michigan meridian, on left bank 0.5 mile downstream from confluence of Brule and Michigamme Rivers, 3.5 miles northeast of Florence, and at mile 117.

Drainage area.--1,780 sq mi.

Records available.--January 1914 to September 1968. Published as "at Twin Falls near Iron Mountain, Mich." 1914-57. Records published for both sites July 1950 to September 1957.

Gage.--Digital water-stage recorder. Altitude of gage is 1,120 ft (from topographic map). Prior to July 1950, headwater and tailwater gages and generation data entered hourly in daily log sheets by company employees at the Twin Falls Powerplant of Wisconsin-Michigan Power Co., 10.4 miles downstream. July 5, 1950 to Aug. 14, 1963, graphic water-stage recorder at present site and datum.

Average discharge.--54 years, 1,777 cfs.

Extremes.--Maximum discharge during year, 7,640 cfs Sept. 10 (gage height, 8.42 ft); minimum, 179 cfs Aug. 15 (gage height, 1.80 ft); minimum daily, 601 cfs Jan. 28.
1914-68: Maximum discharge, 19,500 cfs Apr. 26, 1960 (gage height, 14.15 ft); minimum daily, 154 cfs Aug. 9, 1925.

Remarks.--Records excellent. Prior to July 1950 discharge determined from powerplant records computed on basis of load-discharge rating of hydroelectric units and rating for tailwater gage during periods of spill. Rating developed by Geological Survey. Flow regulated by powerplants, and by Michigamme Reservoir (capacity, 119,950 acre-ft) and Peavy Pond (capacity, 33,860 acre-ft) on Michigamme River, and by many smaller reservoirs above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	623	3,420	1,610	1,080	1,300	1,290	1,920	2,370	3,090	5,660	2,560	969
2	1,380	2,720	1,320	1,510	1,390	1,190	2,250	2,410	2,920	4,750	2,410	1,350
3	1,230	2,340	1,480	1,400	1,340	1,170	2,980	2,060	2,670	4,300	2,410	1,710
4	1,270	2,610	1,580	1,490	1,130	1,670	2,780	1,940	2,480	3,350	2,420	1,630
5	1,020	2,620	1,510	1,390	1,520	2,040	2,040	1,990	2,390	3,170	2,140	2,940
6	1,280	2,700	1,500	1,250	1,530	1,660	1,650	1,910	2,420	2,400	1,920	2,710
7	736	2,320	1,620	1,070	1,750	1,400	1,700	1,920	2,730	1,750	1,900	2,570
8	1,250	2,340	1,490	1,880	2,070	1,710	1,740	1,470	2,780	2,100	1,740	3,060
9	1,820	2,300	1,560	1,470	1,890	1,430	1,780	1,420	3,410	1,990	1,610	5,140
10	1,680	2,720	1,360	1,570	1,680	1,630	1,640	1,070	4,130	1,830	1,470	7,130
11	1,410	2,620	1,490	1,460	1,670	1,840	1,720	1,180	4,120	1,770	1,120	6,560
12	1,330	2,340	1,490	1,690	1,700	1,850	1,610	775	4,160	1,800	1,400	4,820
13	1,570	2,620	1,420	1,400	1,650	1,500	1,730	1,150	4,140	2,050	1,420	4,450
14	1,250	2,300	1,510	689	1,780	1,360	1,740	1,450	4,150	2,530	1,450	4,870
15	840	2,310	1,570	1,680	1,670	1,340	1,890	1,430	3,250	2,270	1,310	4,600
16	1,200	2,290	1,490	1,440	1,690	1,490	2,090	1,510	2,360	2,340	1,330	3,060
17	1,420	2,280	1,390	1,530	1,610	2,060	2,200	1,540	2,130	2,060	919	2,580
18	1,630	2,220	1,780	1,180	1,670	2,540	2,690	1,450	2,000	2,500	979	2,760
19	1,570	2,180	1,690	1,430	1,830	1,960	2,930	1,470	2,120	2,510	1,780	2,940
20	1,670	2,230	1,790	1,020	1,740	2,080	2,860	1,660	2,440	2,490	1,800	3,070
21	1,450	2,150	1,880	808	1,780	1,560	2,940	1,690	3,450	2,680	2,100	3,020
22	1,320	2,030	1,810	1,570	1,870	1,770	2,800	1,630	3,790	2,740	2,010	2,900
23	1,570	2,010	1,420	1,340	1,650	1,290	3,310	1,600	3,090	2,990	1,750	2,840
24	1,840	2,190	1,370	1,260	1,320	1,060	3,620	1,670	2,860	2,530	1,100	2,690
25	2,500	2,190	1,280	1,310	1,090	1,290	2,910	1,470	3,460	2,030	1,120	2,770
26	3,250	2,020	1,670	1,200	1,630	1,290	2,780	2,110	3,610	1,940	1,490	2,750
27	3,250	2,110	1,710	1,020	1,410	1,130	2,750	2,490	4,170	1,870	1,450	2,620
28	2,910	2,060	1,770	601	1,400	1,470	2,410	2,620	4,320	1,900	1,250	2,230
29	2,880	1,460	1,670	1,460	1,400	1,630	2,340	2,480	4,110	1,900	1,150	1,450
30	3,160	1,600	1,300	1,580	------	1,800	2,430	2,910	5,200	2,070	1,030	2,270
31	3,530	------	1,430	1,410	------	1,570	------	2,840	------	2,440	1,000	------
TOTAL	53,839	69,300	47,960	41,188	46,160	49,070	70,230	55,685	97,950	78,710	49,538	94,459
MEAN	1,737	2,310	1,547	1,329	1,592	1,583	2,341	1,796	3,265	2,539	1,598	3,149
MAX	3,530	3,420	1,880	1,880	2,070	2,540	3,620	2,910	5,200	5,660	2,560	7,130
MIN	623	1,460	1,280	601	1,090	1,060	1,610	775	2,000	1,750	919	969

CAL YR 1967 TOTAL 802,965 MEAN 2,200 MAX 11,100 MIN 479
WTR YR 1968 TOTAL 754,089 MEAN 2,060 MAX 7,130 MIN 601

4-0645. Pine River at Pine River powerplant, near Florence, Wis.

Location.--Lat 45°49'40", long 88°14'55", in sec. 28, T. 39 N., R. 18 E., at powerplant of Wisconsin-Michigan Power Co., 5.0 miles downstream from Popple River and 6.5 miles south of Florence.

Drainage area.--528 sq mi.

Records available.--October 1923 to September 1968.

Average discharge.--45 years, 423 cfs.

Extremes.--Maximum daily discharge during year, 2,220 cfs July 1; minimum daily, 155 cfs Nov. 28.
1923-68: Maximum daily discharge, 4,380 cfs Apr. 9, 1929; no flow at times during 1924, 1926-27, 1930-31, 1933, 1940.

Remarks.--Records good except those above 700 cfs and those below 100 cfs, which are fair. Daily discharge determined from powerplant records. Flow regulated by powerplant at station, but pondage is small and monthly discharge is very nearly natural flow.

Cooperation.--Records of daily discharge computed by Wisonsin-Michigan Power Co., on basis of load-discharge rating of hydroelectric units as developed by Geological Survey and gate ratings based on theoretical formulas.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	259	744	312	200	211	177	624	624	1.360	2.220	744	430
2	282	744	312	200	267	177	602	602	1.400	2.020	664	624
3	281	664	222	200	200	177	559	559	1.100	1.800	559	624
4	229	624	312	200	222	177	494	559	1.100	1.600	494	624
5	252	624	267	200	200	177	494	559	944	1.360	494	934
6	229	529	222	177	222	177	494	529	864	1.020	494	1.100
7	252	416	312	200	222	200	494	498	724	864	416	1.020
8	378	442	312	177	211	200	494	477	764	824	416	984
9	540	378	312	200	200	227	494	416	864	714	416	1.610
10	744	468	267	177	200	184	494	416	864	624	364	2.140
11	744	468	222	177	200	205	424	416	824	624	312	1.930
12	664	390	312	200	200	205	442	364	804	572	446	1.820
13	624	442	312	200	200	184	494	423	724	560	281	1.660
14	602	416	267	200	200	184	601	404	724	1.050	333	1.350
15	581	319	177	200	200	184	764	520	684	1.140	281	1.100
16	494	382	222	200	188	184	864	644	624	1.030	307	944
17	494	378	267	200	200	269	864	814	624	904	307	864
18	468	416	222	200	200	357	824	704	572	864	281	864
19	494	312	312	200	177	537	744	624	498	804	378	864
20	381	342	267	200	177	624	824	624	559	824	520	864
21	381	326	222	200	177	559	1.020	591	681	824	505	844
22	333	420	312	188	177	433	1.020	494	1.040	824	516	744
23	369	333	289	267	177	342	1.070	516	1.100	664	494	704
24	378	356	222	177	155	312	1.100	914	1.060	624	494	704
25	884	333	222	200	155	312	1.040	1.100	944	602	484	624
26	1.180	333	267	200	177	403	944	1.100	984	555	406	624
27	1.220	307	177	200	177	414	864	1.220	1.520	603	381	613
28	1.160	155	222	200	177	624	739	1.350	1.700	684	333	546
29	1.010	177	267	177	177	764	744	1.580	1.560	744	333	494
30	904	222	177	200	------	804	684	1.520	1.880	684	304	494
31	864	------	200	222	------	684	------	1.400	------	684	251	------
TOTAL	17.675	12.460	8.007	6.139	5.646	10.457	21.313	22.561	29.090	28.810	13.008	28.741
MEAN	570	415	258	198	195	337	710	728	970	929	420	958
MAX	1,220	744	312	267	267	804	1,100	1,580	1,880	2,220	744	2,140
MIN	229	155	177	177	155	177	424	364	498	555	251	430
CFSM	1.08	.786	.489	.375	.369	.638	1.34	1.38	1.84	1.76	.795	1.81
IN.	1.24	.88	.56	.43	.40	.74	1.50	1.59	2.05	2.03	.92	2.02

CAL YR 1967:	TOTAL	194,363	MEAN	532	MAX	2,800	MIN	155	CFSM	1.01	IN.	13.69
WTR YR 1968:	TOTAL	203,907	MEAN	557	MAX	2,220	MIN	155	CFSM	1.05	IN.	14.36

4-0653. West Branch Sturgeon River near Randville, Mich.

Location.--Lat 46°00'45", long 87°58'41", in NE 1/4 sec.30, T.42 N., R.29 W., on right bank 500 ft downstream from county highway bridge, 3 miles downstream from Tom Kings Creek, and 4 miles northeast of Randville.

Drainage area.--56.1 sq mi.

Records available.--August 1958 to September 1968.

Gage.--Digital water-stage recorder. Altitude of gage is 1,170 ft (from topographic map). Prior to July 16, 1965, graphic water-stage recorder at present site and datum.

Average discharge.--10 years, 41.1 cfs (adjusted for diversion).

Extremes.--Maximum discharge during year, 507 cfs July 1 (gage height, 6.18 ft); minimum daily, 13 cfs Dec. 29 to Jan. 13; minimum gage height, 1.69 ft, Oct. 7.
1958-68: Maximum discharge, 570 cfs May 7, 1960 (gage height, 6.40 ft); minimum, 1.5 cfs July 22, 1964 (gage height, 1.35 ft).

Remarks.--Records fair. Since December 1958, diversion above station for industrial use; figures of runoff adjusted thereafter. Small diversions for sprinkler irrigation.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	19	75	20	13	17	15	59	45	92	462	64	35
2	19	64	21	13	17	15	47	41	109	402	45	72
3	19	54	20	13	17	15	40	45	94	248	32	62
4	19	47	20	13	17	15	45	59	70	145	27	47
5	17	41	20	13	17	15	40	54	54	94	24	127
6	18	36	20	13	17	15	35	45	45	68	27	181
7	17	34	19	13	17	15	29	39	57	53	27	166
8	55	33	19	13	17	15	32	36	103	47	24	134
9	74	32	19	13	17	15	33	34	146	42	24	172
10	54	31	18	13	16	16	32	34	130	36	22	294
11	40	33	18	13	16	16	31	33	89	31	20	357
12	31	36	17	13	16	16	31	31	99	34	19	271
13	32	34	17	13	16	16	46	30	96	36	19	173
14	38	32	16	13	16	16	70	32	78	54	18	109
15	38	31	15	13	15	17	94	50	79	67	16	77
16	35	30	16	13	15	20	83	81	61	49	19	60
17	29	29	17	13	15	24	75	150	50	40	19	50
18	26	27	17	13	15	35	77	175	45	50	18	49
19	26	24	17	13	15	45	69	119	51	46	30	69
20	27	22	17	14	15	42	64	75	44	36	106	70
21	27	24	17	14	15	38	108	58	70	66	95	64
22	27	24	17	14	15	33	124	51	134	106	59	52
23	26	23	17	15	15	30	100	59	151	98	43	58
24	34	23	16	15	15	30	115	84	132	58	33	60
25	119	23	16	15	15	30	124	77	104	43	25	50
26	170	22	15	16	15	35	96	59	81	34	22	44
27	158	18	14	16	15	44	76	73	119	56	20	41
28	106	17	14	16	15	46	65	111	196	71	19	38
29	75	18	13	16	15	74	56	150	198	50	17	34
30	83	19	13	17	------	75	50	136	205	38	15	33
31	90	------	13	17	------	68	------	98	------	58	15	------
TOTAL	1,548	956	528	432	458	901	1,946	2,169	2,982	2,718	967	3,049
MEAN	49.9	31.9	17.0	13.9	15.8	29.1	64.9	70.0	99.4	87.7	31.2	102
MAX	170	75	21	17	17	75	124	175	205	462	106	357
MIN	17	17	13	13	15	15	29	30	44	31	15	33
+	3.9	1.5	2.8	3.2	3.1	3.2	4.4	3.1	3.6	4.0	3.9	3.2
MEAN‡	53.8	33.4	19.8	17.1	18.9	32.3	69.3	73.1	103	91.7	35.1	105
CFSM‡	.96	.60	.35	.30	.34	.58	1.24	1.30	1.84	1.63	.63	1.87
IN‡	1.11	.67	.40	.35	.37	.67	1.38	1.50	2.05	1.88	.73	2.09

CAL YR 1967	TOTAL 16,629.8	MEAN 45.6	MAX 303	MIN 9.8	MEAN‡ 48.8	CFSM‡ 0.87	IN‡ 11.79
WTR YR 1968	TOTAL 18,654	MEAN 51.0	MAX 462	MIN 13	MEAN‡ 54.4	CFSM‡ 0.97	IN‡ 13.20

\+ Average monthly diversion, equivalent in cubic feet per second, for industrial use; furnished by Hanna Mining Co.
‡ Adjusted for diversion.

4-0655. Sturgeon River near Foster City, Mich.

Location.--Lat 45°54'30", long 87°45'15", in NW 1/4 sec.36, T.41 N., R.28 W., on left bank 30 ft downstream from bridge on County Highway 569, 1.8 (revised) miles downstream from confluence of East and West Branches, and 4 miles south of Foster City.

Drainage area.--237 sq mi.

Records available.--October 1954 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 966.6 ft above mean sea level, datum of 1929.

Average discharge.--14 years, 174 cfs (adjusted for diversion).

Extremes.--Maximum discharge during year, 1,470 cfs July 2 (gage height, 8.52 ft); minimum, 41 cfs Oct. 7 (gage height, 2.32 ft).
1954-68: Maximum discharge, 2,570 cfs May 8, 1960 (gage height, 10.35 ft); minimum, 15 cfs July 24, 1964 (gage height, 2.00 ft).

Remarks.--Records good except those for winter months or those for no gage-height record, which are fair. Since December 1958, diversion above station for industrial use; figures of runoff adjusted since. Small diversions for sprinkler irrigation. Records of water temperatures for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	46	270	90	47	54	47	290	259	545	1,320	232	109
2	49	250	92	46	54	47	254	227	592	1,460	219	273
3	47	220	92	46	54	48	217	212	552	1,440	192	330
4	46	205	90	45	54	48	200	246	486	1,320	166	313
5	48	185	88	45	54	48	188	263	418	1,090	144	393
6	45	170	86	44	53	48	174	254	351	770	130	550
7	42	150	84	44	53	48	166	231	283	530	119	548
8	66	145	82	43	52	48	158	205	239	393	112	588
9	118	135	80	43	52	49	158	187	241	313	107	680
10	148	130	78	42	51	49	161	176	273	246	100	815
11	146	125	75	42	50	50	155	163	315	210	94	855
12	128	120	72	42	50	50	154	154	321	187	89	878
13	114	120	70	42	50	51	197	146	296	177	83	892
14	113	115	68	42	49	52	268	142	304	212	77	800
15	113	110	66	42	49	55	361	187	307	263	73	608
16	113	110	67	42	48	60	389	259	277	259	72	434
17	115	105	68	42	48	70	389	391	241	226	76	330
18	110	100	69	42	48	90	389	442	216	204	74	273
19	95	95	70	43	47	115	378	462	204	195	86	250
20	92	92	70	43	47	140	357	454	193	184	168	255
21	92	93	70	44	47	125	397	387	229	209	238	264
22	92	94	70	45	47	110	424	319	422	304	248	255
23	92	95	67	46	47	100	456	288	535	321	227	239
24	92	95	64	48	47	100	495	307	585	317	197	231
25	120	92	61	49	47	105	530	311	578	286	166	219
26	250	90	57	50	47	120	520	294	555	254	138	204
27	350	88	55	50	47	170	476	309	618	263	119	190
28	370	85	53	51	47	236	416	402	738	268	103	177
29	330	83	51	52	47	307	359	510	738	245	92	166
30	250	85	49	52	------	321	306	548	846	226	85	155
31	260	------	48	53	------	319	------	545	------	222	78	------
TOTAL	4,092	3,852	2,202	1,407	1,440	3,226	9,382	9,280	12,498	13,914	4,104	12,274
MEAN	132	128	71.0	45.4	49.7	104	313	299	417	449	132	409
MAX	370	270	92	53	54	321	530	548	846	1460	248	892
MIN	42	83	48	42	47	47	154	142	193	177	72	109
+	3.9	1.5	2.8	3.2	3.1	3.2	4.4	3.1	3.6	4.0	3.9	3.2
MEAN‡	136	130	73.8	48.6	52.8	107	317	302	421	453	136	412
CFSM‡	.57	.55	.31	.20	.22	.45	1.34	1.27	1.78	1.91	.57	1.74
IN.‡	.66	.61	.36	.24	.24	.52	1.50	1.46	1.99	2.20	.66	1.94

CAL YR 1967	TOTAL 70,552	MEAN 193	MAX 1,520	MIN 33	MEAN‡ 196	CFSM‡ .83	IN.‡ 11.24
CAL YR 1968	TOTAL 77,671	MEAN 212	MAX 1,460	MIN 42	MEAN‡ 215	CFSM‡ .91	IN.‡ 12.38

\+ Average monthly diversion, equivalent in cubic feet per second, for industrial use; furnished by M. A. Hanna Coal and Ore Co.
‡ Adjusted for diversion.

Note.--No gage-height record Oct. 17 to Dec. 6.

GPO 817-436-6

4-0660. Menominee River near Pembine, Wis.

Location.--Lat 45°35'25", long 87°46'35", in sec. 21, T. 37 N., R. 28 W., Michigan meridian, on left bank 700 ft upstream from Pemene Creek, 4 miles west of Nathan, Mich., 15 miles southeast of Pembine, and at mile 65.3.

Drainage area.--3,240 sq mi, approximately.

Records available.--October 1949 to September 1968. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Digital water-stage recorder. Altitude of gage is 745 ft (from river-profile map). Prior to Oct. 18, 1967, graphic water-stage recorder at same site and datum.

Average discharge.--19 years, 2,947 cfs.

Extremes.--Maximum discharge during year, 12,400 cfs Sept. 11 (gage height, 8.84 ft); maximum gage height, 11.92 ft Dec. 25 (backwater from ice); minimum discharge, 1,020 cfs Oct. 7 (gage height, 2.05 ft).
1949-68: Maximum discharge, 26,900 cfs May 8, 1960 (gage height, 13.90 ft); minimum, 708 cfs Sept. 1, 1965 (gage height, 1.68 ft).

Remarks.--Records good except those for winter months, which are fair. Flow regulated by powerplants and by Michigamme Reservoir (capacity, 119,950 acre-ft) and Peavy Pond (capacity, 33,860 acre-ft) on the Michigamme River, and by many smaller reservoirs above station.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.410	5.590	2.200	1.700	2.000	1.700	3.320	4.140	6.320	11.300	4.180	1.750
2	1.370	4.510	2.100	1.600	2.000	1.500	3.370	3.920	6.230	10.300	3.730	1.700
3	1.890	4.540	2.000	1.700	1.900	1.250	3.660	3.350	6.080	9.850	3.960	1.900
4	1.760	3.930	2.100	1.900	1.800	1.300	4.180	3.350	5.440	8.080	3.230	3.170
5	1.640	3.960	2.200	1.800	1.700	2.300	3.560	3.340	4.930	7.270	3.440	4.320
6	1.620	3.870	2.100	1.900	1.900	2.400	3.180	3.420	4.640	5.810	3.240	5.290
7	1.380	3.800	2.250	1.650	2.200	2.200	3.070	3.190	4.700	4.960	3.020	5.220
8	1.810	3.240	2.200	1.550	2.200	2.000	2.570	2.980	4.660	3.890	2.700	5.870
9	2.650	3.310	2.150	1.600	2.400	2.200	2.830	2.600	4.510	3.980	2.520	7.110
10	2.670	3.600	2.200	2.200	2.500	2.000	2.750	2.310	5.640	3.690	2.490	11.100
11	2.710	3.650	1.900	1.950	1.900	2.100	2.630	2.280	5.980	3.230	2.340	12.100
12	2.610	3.060	2.000	1.900	2.300	2.500	2.590	1.760	5.950	3.150	1.950	10.300
13	2.530	3.640	2.100	1.800	2.000	2.600	2.770	1.800	6.080	3.370	1.710	8.140
14	2.610	3.390	2.200	1.800	2.300	2.200	3.860	2.290	6.040	3.670	2.040	7.780
15	2.210	3.360	2.100	1.700	2.460	1.900	3.990	2.900	5.760	4.450	2.010	7.640
16	2.090	3.390	2.000	1.600	2.300	2.100	4.200	3.280	4.770	4.930	2.110	6.490
17	2.180	3.100	2.100	2.050	2.100	2.700	4.770	4.200	4.000	4.360	1.920	4.870
18	2.290	3.040	2.000	2.000	2.000	3.100	4.620	3.630	3.460	4.060	1.720	4.290
19	2.450	2.880	2.200	1.950	2.000	3.400	4.860	3.550	3.450	4.000	1.840	4.530
20	2.640	3.030	2.500	1.750	2.050	3.600	5.060	3.800	3.550	3.840	3.300	5.130
21	2.660	2.860	2.700	1.350	2.100	3.600	5.390	3.450	5.040	4.180	3.900	5.220
22	2.250	2.810	2.300	1.700	2.200	2.900	5.410	3.070	5.760	4.760	4.100	4.470
23	1.960	2.840	2.300	1.750	2.300	2.600	5.800	2.940	6.490	4.680	3.600	4.730
24	2.190	2.860	2.000	1.800	2.100	2.200	6.470	3.240	5.650	4.680	3.000	4.540
25	3.800	2.850	1.700	1.850	1.400	1.900	6.520	3.580	5.760	3.820	2.400	4.380
26	4.840	2.800	1.600	1.800	1.300	2.500	5.650	4.040	6.400	3.620	2.200	3.940
27	5.960	2.700	1.900	1.700	1.900	2.700	5.420	4.630	7.700	3.240	2.600	4.180
28	5.470	2.600	2.000	1.500	1.950	2.810	5.050	5.520	9.200	3.740	2.400	4.030
29	4.960	2.400	2.200	1.400	2.000	3.040	4.350	5.860	8.950	3.310	2.100	3.020
30	5.110	2.300	2.050	1.800	------	3.510	4.330	6.660	8.900	3.410	2.000	2.830
31	5.510	------	1.900	1.700	------	3.270	------	6.340	------	3.730	1.800	------
TOTAL	87.230	99.910	65.250	54.450	59.260	76.080	126.230	111.420	172.040	151.360	83.550	160.040
MEAN	2,814	3,330	2,105	1,756	2,043	2,454	4,208	3,594	5,735	4,883	2,695	5,335
MAX	5,960	5,590	2,700	2,200	2,500	3,600	6,520	6,660	9,200	11,300	4,180	12,100
MIN	1,370	2,300	1,600	1,350	1,300	1,250	2,570	1,760	3,450	3,150	1,710	1,700

CAL YR 1967: TOTAL 1,270,670 MEAN 3,481 MAX 16,600 MIN 1,190
WTR YR 1968: TOTAL 1,246,820 MEAN 3,407 MAX 12,100 MIN 1,250

4-0665. Pike River at Amberg, Wis.

Location.--Lat 45°29'50", long 87°59'40", in SW ¼ sec. 15, T. 35 N., R. 20 E., on left bank 500 ft upstream from Chicago, Milwaukee, St. Paul and Pacific Railroad bridge, 0.2 mile south of Amberg, and 1.2 miles downstream from confluence of North and South Branch.

Drainage area.--253 sq mi.

Records available.--February 1914 to September 1968.

Gage.--Digital water-stage recorder. Altitude of gage is 865 ft above mean sea level (from survey level line along railroad). Prior to May 23, 1931, chain gage at railway bridge at datum 1 ft higher. May 23, 1931, to Aug. 4, 1934, chain gage at highway bridge three-quarters of a mile downstream at different datum. Aug. 5, 1934, to Oct. 6, 1946, staff gage, and Oct. 7, 1946, to June 8, 1964, graphic water-stage recorder at present site and datum.

Average discharge.--54 years, 216 cfs.

Extremes.--Maximum discharge during year, 851 cfs June 28 (gage height, 4.22 ft); minimum daily, 106 cfs Jan. 7 (backwater from ice). 1914-68: Maximum discharge, 2,800 cfs Apr. 10, 1922 (gage height, 7.8 ft, from graph based on gage readings, site and datum then in use), from rating curve extended above 1,100 cfs; minimum observed, 26 cfs Dec. 27, 1925 (gage height, 1.30 ft, site and datum then in use).

Remarks.--Records good except those for winter months, which are fair.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	124	281	160	124	146	116	213	260	533	554	170	155
2	122	259	156	120	144	118	194	241	548	459	167	198
3	120	239	156	116	142	120	182	237	479	363	146	202
4	119	221	158	114	140	126	241	269	394	305	137	184
5	116	205	154	110	138	134	252	277	324	280	142	283
6	114	188	150	108	134	140	234	252	288	254	149	421
7	114	180	150	106	132	146	217	233	264	232	149	402
8	144	172	148	108	130	150	217	221	240	223	152	422
9	200	168	144	108	128	150	218	213	223	269	152	543
10	199	168	142	110	126	150	209	204	226	260	145	656
11	179	172	140	110	120	148	200	198	222	228	139	634
12	163	179	138	112	116	144	197	192	235	211	134	496
13	161	175	136	114	114	140	341	190	229	206	132	371
14	173	166	138	116	114	140	498	201	259	238	129	284
15	171	160	150	120	111	146	554	320	318	291	127	245
16	163	154	170	124	110	150	511	387	281	262	135	219
17	155	152	160	126	110	160	452	453	240	237	151	204
18	148	150	150	128	110	170	421	427	219	239	148	206
19	142	148	146	133	110	178	384	348	213	226	216	251
20	139	144	140	134	108	180	374	291	200	204	324	318
21	135	140	136	136	108	180	515	256	306	193	346	348
22	134	136	130	136	110	170	552	234	455	203	281	318
23	134	136	140	138	110	160	514	230	446	192	239	280
24	149	136	144	138	110	150	615	251	376	183	203	256
25	324	136	148	140	110	148	662	269	316	173	177	234
26	471	138	150	140	112	142	552	253	348	165	161	216
27	455	140	150	140	114	156	445	385	615	192	153	205
28	390	156	148	144	114	212	374	579	807	253	146	196
29	322	170	142	144	116	253	329	704	760	223	141	191
30	296	164	136	146	------	231	312	701	624	191	135	183
31	302	------	130	146	------	222	------	605	------	174	133	------
TOTAL	6,078	5,133	4,540	3,889	3,487	4,930	10,979	9,881	10,988	7,683	5,259	9,121
MEAN	196	171	146	125	120	159	366	319	366	248	170	304
MAX	471	281	170	146	146	253	662	704	807	554	346	656
MIN	114	136	130	106	108	116	182	190	200	165	127	155
CFSM	.77	.68	.58	.50	.48	.63	1.45	1.26	1.45	.98	.67	1.20
IN.	.89	.75	.67	.57	.51	.72	1.61	1.45	1.62	1.13	.77	1.34

CAL YR	1967:	TOTAL	80,762	MEAN	221	MAX	1,130	MIN	98	CFSM	.87	IN.	11.87
WTR YR	1968:	TOTAL	81,968	MEAN	224	MAX	807	MIN	106	CFSM	.89	IN.	12.05

4-0670. Menominee River below Koss, Mich.

Location.--Lat 45°21'50", long 87°39'20", in sec. 9, T. 34 N., R. 27 W., Michigan meridian, on left bank at powerplant of Wisconsin Public Service Corp., 0.5 mile upstream from Little Cedar River, 3.6 miles southeast of Koss, and at mile 24.7.

Drainage area.--3,790 sq mi, approximately.

Records available.--July 1907 to March 1909 (published as "at Koss"), July 1913 to September 1968.

Gage.--Headwater and tailwater gages and generation data entered hourly in daily log sheet by company employees. Prior to June 1913, chain gage on railroad bridge 4 miles upstream.

Average discharge.--56 years (1907-8, 1913-68), 3,112 cfs.

Extremes.--Maximum daily discharge during year, 12,600 cfs Sept. 12; minimum daily, 1,260 cfs Oct. 2.
1908, 1913-68: Maximum daily discharge, 33,000 cfs May 10, 1960; minimum daily, 162 cfs Sept. 15, 1931.

Remarks.--Records fair. Daily discharge computed on basis of average daily load and load-discharge rating of combined hydroelectric units. Flow regulated by powerplants, and by Michigamme Reservoir (capacity, 119,950 acre-ft) and Peavy Pond (capacity 33,860 acre-ft) on Michigamme River, and by many smaller reservoirs above station.

Cooperation.--Records of daily discharge furnished by Wisconsin Public Service Corp. since 1913.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1 830	6.530	2.430	1.860	1.790	1.800	3.720	4.470	6.470	10.600	3.760	1.870
2	1.260	6.620	2.440	1.710	2.170	1.800	3.720	4.350	6.920	11.300	4.070	1.920
3	1.850	5.400	2.400	1.700	2.020	1.510	3.660	4.110	6.370	11.600	4.070	2.670
4	1.650	5.280	2.250	1.680	2.090	1.340	3.720	3.720	5.930	9.630	3.760	2.970
5	1.920	4.680	2.350	1.780	2.020	1.570	4.070	3.760	5.320	7.810	3.240	3.970
6	1.710	4.790	2.640	1.850	1.800	2.230	3.820	3.720	4.830	6.280	3.120	4.910
7	1.510	4.750	2.620	1.850	2.020	2.350	3.660	3.570	4.630	4.890	3.150	5.270
8	1.740	4.030	2.500	1.650	2.200	2.100	3.720	3.530	4.470	4.660	3.030	5.790
9	2.280	4.130	2.150	1.580	2.230	2.120	3.100	3.150	4.110	4.160	2.690	7.080
10	2.700	4.520	2.410	1.510	2.650	2.110	3.300	2.860	5.260	3.560	2.560	8.450
11	3.120	3.520	2.300	2.060	2.250	2.080	3.120	2.740	5.560	3.420	2.210	11.200
12	2.740	3.620	2.150	2.000	2.050	2.200	3.150	2.530	5.890	3.360	2.420	12.600
13	2.400	3.570	2.270	1.980	2.160	2.500	3.360	2.350	6.330	3.410	2.150	10.400
14	2.810	3.800	1.830	2.030	2.020	2.520	4.420	2.350	5.520	3.480	1.670	8.320
15	2.480	3.970	1.870	1.740	2.180	2.180	4.910	2.840	6.410	4.070	2.130	8.490
16	2.300	3.710	2.170	1.750	2.130	2.030	4.820	2.880	5.420	4.050	2.080	7.620
17	2.210	3.540	2.500	1.660	2.160	2.120	4.900	3.980	4.260	4.300	2.100	5.600
18	2.230	3.280	2.350	2.020	1.980	2.860	4.970	4.220	3.870	4.300	1.950	4.780
19	2.480	3.160	2.300	2.080	2.000	3.650	5.360	3.040	3.360	4.030	2.180	4.250
20	2.500	3.120	2.210	1.980	2.040	3.920	5.390	3.000	3.360	3.360	2.870	4.240
21	3.280	3.000	2.770	1.870	1.970	3.900	5 790	3.760	4.330	3.360	3.870	5.000
22	3.190	3.120	2.640	1.400	2.150	3.530	6.420	4.030	5.530	4.560	3.590	4.510
23	2.110	3.000	2.080	1.620	2.180	3.680	6.350	3.930	6.790	4.240	3 720	4.380
24	2.170	2.880	2.300	1.780	2.220	3.170	7.400	3.120	5.940	4.560	3.200	4.560
25	4.150	3.000	2.090	1.870	2.150	2.470	7.280	3.240	6.120	4.300	2.250	4.460
26	4.990	3.120	1.680	1.820	1.360	2.590	6.510	3.360	6.600	3.240	2.520	4.330
27	5.470	2.560	1.690	1.870	1.420	2.760	5.470	4.220	7.940	3.610	2.450	4.030
28	6.640	2.340	1.890	1.730	1.990	3.000	5.750	5.140	9.160	3.240	2.280	4.330
29	5.760	2.500	2.040	1.470	1.950	2.780	5.060	6.080	10.700	3.360	2.120	3.360
30	6.340	2.480	2.130	1.520	------	3.240	4.780	7.060	10.900	3.600	2.320	2.890
31	6.220	------	1.870	1.840	------	3.300	------	7.180	------	3.720	1.980	------
TOTAL	94.040	114.020	69.320	55.260	59.350	79.410	141.700	118.290	178.300	154.060	85.510	164.250
MEAN	3,034	3,801	2,236	1,783	2,047	2,562	4,723	3,816	5,943	4,970	2,758	5,475
MAX	6,640	6,620	2,770	2,080	2,650	3,920	7,400	7,180	10,900	11,600	4,070	12,600
MIN	1,260	2,340	1,680	1,400	1,360	1,340	3,100	2,350	3,360	3,240	1,670	1,870

CAL YR 1967: TOTAL 1,315,390 MEAN 3,604 MAX 16,900 MIN 1,100
WTR YR 1968: TOTAL 1,313,510 MEAN 3,589 MAX 12,600 MIN 1,260

4-0964. St. Joseph River near Burlington, Mich.

Location.--Lat 42°06'10", long 85°02'25", in SW¼ SW¼ sec. 20, T.4 S., R.6 W., on right bank 10 ft upstream from bridge on 13 Mile Rd., 2.0 miles east of Burlington, and 4.0 miles downstream from Tekonsha Creek.

Drainage area.--201 sq mi.

Records available.--October 1962 to September 1968.

Gage.--Digital water-stage recorder. Altitude of gage is 930 ft (from topographic map). Prior to May 15, 1968, graphic water-stage recorder at same site and datum.

Average discharge.--6 years, 124 cfs.

Extremes.--Maximum discharge during year, 1,000 cfs Feb. 5 (gage height, 5.51 ft); minimum, 40 cfs Oct. 7 (gage height, 2.02 ft). 1962-68: Maximum discharge, that of Feb. 5, 1968; minimum, 8.0 cfs Aug. 9, 10, 11, 1964; minimum gage height, 1.71 ft Aug. 8, 9, 10, 11, 1964.

Remarks.--Records good except those for winter period and those for period of no gage height record which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	60	141	132	250	515	150	311	162	281	716	213	90
2	54	161	126	230	779	150	299	156	299	689	189	108
3	61	167	125	210	833	150	291	153	321	644	176	102
4	51	181	125	200	860	150	375	147	331	591	168	101
5	47	189	131	190	900	150	404	143	333	543	158	98
6	44	189	138	180	870	159	375	140	319	495	149	90
7	41	187	146	180	800	159	373	137	289	428	146	86
8	42	181	155	170	700	164	368	137	246	368	146	81
9	49	174	161	160	600	191	351	135	208	325	140	81
10	50	167	182	160	550	204	333	131	179	285	134	83
11	57	170	249	150	500	210	317	131	164	247	128	87
12	57	174	291	150	450	210	295	132	161	218	120	90
13	57	170	303	150	410	191	273	129	149	206	113	89
14	57	165	307	140	380	193	269	134	140	210	105	86
15	65	156	311	140	350	194	275	132	132	223	99	81
16	107	146	311	140	320	203	255	144	123	220	135	77
17	132	159	309	140	290	231	249	146	117	208	150	74
18	149	173	335	150	270	255	253	150	113	193	150	92
19	155	174	331	150	240	273	246	161	110	173	158	104
20	161	176	317	150	220	283	238	165	104	156	164	123
21	168	179	351	160	210	289	232	167	104	146	168	150
22	165	179	444	160	200	289	222	164	117	144	162	170
23	153	176	437	160	190	287	216	158	110	141	153	180
24	140	170	392	160	180	291	210	150	123	225	141	180
25	135	164	440	150	170	305	204	141	199	275	126	180
26	122	161	458	140	170	335	196	146	611	257	116	170
27	135	152	461	140	160	341	186	182	829	247	108	170
28	150	146	420	213	150	333	178	210	779	259	101	160
29	144	137	370	293	150	331	174	231	721	251	95	150
30	141	137	330	375	------	325	168	251	721	240	89	150
31	138	------	300	392	------	321	------	267	------	227	83	------
TOTAL	3,087	5,001	8,888	5,733	12,417	7,317	8,136	4,932	8,433	9,550	4,283	3,483
MEAN	99.6	167	287	185	428	236	271	159	281	308	138	116
MAX	168	189	461	392	900	341	404	267	829	716	213	180
MIN	41	137	125	140	150	150	168	129	104	141	83	74
CFSM	.50	.83	1.43	.92	2.13	1.17	1.35	.79	1.40	1.53	.69	.58
IN.	.57	.93	1.64	1.06	2.30	1.35	1.51	.91	1.56	1.77	.79	.64

CAL YR 1967 TOTAL 64,054 MEAN 175 MAX 671 MIN 22 CFSM .87 IN 11.85
WTR YR 1968 TOTAL 81,260 MEAN 222 MAX 900 MIN 41 CFSM 1.10 IN 15.04

Note.--No gage height record Feb. 4-12.

4-0966. Coldwater River near Hodunk, Mich.

Location.-- Lat 42°01'45", long 85°06'25", in N½ sec. 22, T.5 S., R.7 W., on upstream side of bridge on Girard Rd., 2.5 miles northwest of Hodunk, and 3.5 miles upstream from mouth.

Drainage area.--293 sq mi.

Records available.--October 1962 to September 1968.

Gage.--Digital water-stage recorder. Altitude of gage is 900 ft (from topographic map). Prior to July 26, 1963, wire-weight gage and crest-stage gage and July 26, 1963, to Nov. 12, 1964, graphic water-stage recorder at same site and datum.

Average discharge.--6 years, 182 cfs.

Extremes.--Maximum discharge during year, 1,420 cfs Feb. 4 (gage height, 7.3 ft, estimated); minimum, 25 cfs Oct. 2, 7, 8; minimum gage height, 2.64 ft Oct. 2, 3, 5, 6, 7, 8.
1962-68: Maximum discharge, that of Feb. 4, 1968; minimum, 6.2 cfs Sept. 26, 1964; minimum gage height, 2.28 ft Oct. 4-14, 1964.

Remarks.--Records good except those for winter periods and those for period of no gage-height record, which are fair. Diurnal fluctuation caused by mills above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	30	224	226	415	900	220	420	134	353	1,000	171	146
2	26	252	223	405	1,200	220	401	135	339	884	179	153
3	27	289	221	375	1,340	220	382	136	329	787	177	146
4	28	323	221	350	1,400	220	482	138	315	706	169	140
5	27	348	223	330	1,320	220	647	137	294	646	163	138
6	27	357	231	320	1,200	225	705	139	278	606	158	132
7	26	348	242	310	1,100	230	632	141	256	544	152	127
8	31	337	260	295	1,000	250	576	139	214	524	151	123
9	31	312	276	285	860	275	540	136	154	463	152	124
10	33	302	312	280	760	290	509	135	155	408	147	123
11	49	301	385	270	680	310	468	136	153	386	142	119
12	53	297	530	260	600	300	442	137	163	356	138	120
13	51	304	627	255	540	294	416	139	183	243	133	119
14	125	304	640	250	500	278	407	141	173	259	127	115
15	114	289	600	245	450	289	411	140	167	256	126	111
16	190	280	470	245	420	297	440	158	160	246	165	109
17	322	300	420	245	380	319	438	176	155	237	207	107
18	333	325	400	250	360	351	417	190	153	208	262	115
19	341	365	390	270	340	365	399	192	149	212	295	126
20	349	374	420	270	320	374	391	186	122	181	296	138
21	326	358	540	275	300	386	376	178	121	178	292	160
22	294	341	700	280	280	398	367	170	147	171	274	190
23	262	323	800	280	270	408	355	168	147	168	256	220
24	243	312	850	280	255	406	341	163	143	282	236	235
25	234	299	820	270	245	416	323	153	226	364	218	230
26	214	287	760	255	235	454	311	160	672	367	203	220
27	223	269	660	255	230	507	288	246	1,160	287	192	210
28	231	255	550	300	225	523	262	286	1,320	263	139	195
29	240	238	460	450	225	494	212	300	1,250	239	138	185
30	236	234	430	620	------	468	121	316	1,120	169	145	175
31	217	------	420	720	------	444	------	351	------	158	140	------
TOTAL	4,933	9,147	14,307	9,910	17,935	10,451	12,479	5,456	10,571	11,798	5,743	4,551
MEAN	159	305	462	320	618	337	416	176	352	381	185	152
MAX	349	374	850	720	1,400	523	705	351	1,320	1,000	296	235
MIN	26	224	221	245	225	220	121	134	121	158	126	107
CFSM	.54	1.04	1.58	1.09	2.11	1.15	1.42	.60	1.20	1.30	.63	.52
IN.	.63	1.16	1.82	1.26	2.28	1.33	1.58	.69	1.34	1.50	.73	.58

CAL YR 1967 TOTAL 97,844 MEAN 268 MAX 1,040 MIN 25 CFSM .91 IN 12.42
WTR YR 1968 TOTAL 117,281 MEAN 320 MAX 1,400 MIN 26 CFSM 1.09 IN 14.89

Note.--No gage height record Dec. 14 to Feb. 12.

4-0969. Nottawa Creek near Athens, Mich.

Location.--Lat 42°03'20", long 85°18'30" in NW¼ sec. 12, T.5 S., R.9 W., on right bank at downstream side of bridge on Shorts Road, 4.2 miles southwest of Athens and 5 miles downstream from Pine Creek.

Drainage area.--162 sq mi.

Records available.--October 1966 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 850 ft (from topographic map).

Extremes.--Maximum discharge during year, 546 cfs Feb. 3 (gage height, 4.66 ft); minimum, 38 cfs Oct. 8 (gage height, 0.99 ft). 1966-68: Maximum discharge, 546 cfs Feb. 3, 1968 (gage height, 4.66 ft); minimum, 34 cfs Oct. 12, 13, 1966 (gage height, 0.91 ft).

Remarks.--Records good except those for winter period, which are fair.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	54	98	77	146	355	80	164	116	151	448	145	69
2	55	109	71	119	437	82	151	112	142	397	128	73
3	56	109	71	120	515	76	141	108	130	339	112	72
4	53	128	77	129	528	80	198	105	118	290	103	71
5	52	137	73	117	490	86	229	99	108	252	92	72
6	46	150	80	98	434	92	262	98	99	216	86	71
7	42	145	93	110	366	97	265	94	92	189	84	67
8	40	135	103	107	314	107	235	94	86	171	82	64
9	44	130	104	94	277	130	212	90	79	155	82	62
10	43	126	115	92	240	145	181	87	75	142	84	61
11	42	132	142	90	210	147	158	85	73	130	85	63
12	42	134	185	87	180	146	141	84	76	120	85	63
13	43	132	219	85	160	136	131	82	75	114	85	65
14	46	136	235	84	146	120	131	84	74	107	85	65
15	51	129	226	83	131	123	143	87	80	105	83	65
16	76	117	210	82	125	131	147	105	85	105	84	64
17	79	131	187	83	120	141	158	112	83	103	90	62
18	84	140	158	84	110	152	165	115	80	99	92	62
19	88	138	143	86	106	159	160	117	78	98	94	64
20	90	138	134	90	100	163	156	117	76	95	97	73
21	85	132	165	94	96	169	154	115	75	92	97	81
22	78	123	229	99	92	169	147	111	84	86	96	97
23	70	116	265	102	88	162	142	108	80	84	95	119
24	62	109	312	94	84	155	142	107	74	106	90	130
25	66	104	308	88	82	160	143	102	116	131	86	132
26	61	99	271	81	78	172	147	102	240	168	84	129
27	75	93	250	78	78	191	140	110	333	206	81	123
28	87	93	220	125	81	209	135	119	440	215	77	118
29	88	70	190	178	82	205	128	135	494	202	75	109
30	94	77	170	250	------	192	124	151	488	181	72	100
31	96	------	155	290	------	178	------	158	------	162	69	------
TOTAL	1,988	3,610	5,238	3,465	6,105	4,355	4,930	3,309	4,284	5,308	2,800	2,466
MEAN	64.1	120	169	112	211	140	164	107	143	171	90.3	82.2
MAX	96	150	312	290	528	209	265	158	494	448	145	132
MIN	40	70	71	78	78	76	124	82	73	84	69	61
CFSM	.40	.74	1.04	.69	1.30	.86	1.01	.66	.88	1.06	.56	.51
IN.	.46	.83	1.20	.80	1.40	1.00	1.13	.76	.98	1.22	.64	.57

CAL YR 1967 TOTAL 45,592 MEAN 125 MAX 390 MIN 37 CFSM .77 IN. 10.47
WTR YR 1968 TOTAL 47,858 MEAN 131 MAX 528 MIN 40 CFSM .81 IN. 10.99

4-0971.7. Portage River near Vicksburg, Mich.

Location.—Lat 42°06'53", long 85°29'08", in SW¼ sec. 16, T.4 S., R.10 W., on right bank 15 ft upstream from bridge on W Avenue and 2.4 miles east of Vicksburg.

Drainage area.—68.2 sq mi.

Records available.—March 1946 to September 1951, October 1964 to September 1968.

Gage.—Water-stage recorder. Datum of gage is 839.94 ft above mean sea level, datum of 1929. Mar. 13, 1946 to Sept. 30, 1951, staff gage at same site and datum.

Average discharge.—9 years, 59.8 cfs.

Extremes.—Maximum discharge during year, 230 cfs Feb. 3 (gage height, 5.47 ft, backwater from ice); minimum, 21 cfs Oct. 3, 4, 5; minimum gage height, 3.48 ft Oct. 4, 5.
1946-51, 1964-68: Maximum discharge, 356 cfs Apr. 7, 1947 (gage height, 5.66 ft); minimum, 10 cfs on many days during July and August, 1965; minimum gage height, 3.08 ft July 17, 1946, Aug. 14, 1946, July 30, 31, 1965.

Remarks.—Records good except those for winter period, which are fair.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	42	48	100	132	58	70	54	42	85	50	25
2	22	52	48	90	209	57	66	51	42	81	48	26
3	21	54	50	80	227	57	64	50	41	78	46	26
4	21	58	52	72	222	58	83	49	39	72	44	25
5	22	59	53	68	209	58	89	48	38	69	42	26
6	22	60	53	65	195	58	84	46	37	66	40	25
7	22	59	53	64	183	58	80	43	36	62	39	25
8	22	58	53	64	170	58	75	42	35	60	39	25
9	24	58	70	64	156	63	75	42	34	57	42	26
10	24	58	80	64	140	66	72	42	34	55	40	27
11	24	60	84	64	125	64	68	41	33	53	39	29
12	24	63	89	62	115	62	64	40	33	50	38	28
13	24	64	93	59	110	63	61	39	33	48	37	27
14	24	62	90	61	102	60	64	41	32	47	36	27
15	25	62	87	62	90	60	77	42	32	46	34	28
16	31	60	85	62	83	63	72	49	33	44	34	28
17	33	63	82	61	78	65	69	52	32	43	36	28
18	35	67	82	60	74	64	70	50	32	46	35	29
19	34	68	80	60	70	66	70	52	32	45	33	30
20	33	66	78	60	68	67	67	53	31	44	32	32
21	32	65	95	60	67	69	67	51	31	42	30	32
22	31	63	139	60	66	69	66	48	32	40	29	32
23	30	62	139	60	64	70	62	48	32	40	28	33
24	30	60	134	60	63	70	61	46	35	56	27	34
25	32	58	132	60	62	71	63	44	46	60	26	34
26	33	56	132	57	61	75	61	44	84	56	26	34
27	38	54	120	54	60	76	59	48	93	54	25	34
28	42	54	115	60	59	74	58	48	92	54	25	34
29	41	52	111	70	58	74	56	48	89	54	24	34
30	40	50	106	100	------	72	56	48	88	52	24	35
31	40	------	103	106	------	70	------	44	------	52	24	------
TOTAL	898	1,767	2,736	2,089	3,318	2,015	2,049	1,443	1,323	1,711	1,072	878
MEAN	29.0	58.9	88.3	67.4	114	65.0	68.3	46.5	44.1	55.2	34.6	29.3
MAX	42	68	139	106	227	76	89	54	93	85	50	35
MIN	21	42	48	54	58	57	56	39	31	40	24	25
CFSM	.43	.86	1.29	.99	1.67	.95	1.00	.68	.65	.81	.51	.43
IN.	.49	.96	1.49	1.14	1.81	1.10	1.12	.79	.72	.93	.58	.48

CAL YR 1967	TOTAL	22,155	MEAN	60.7	MAX	170	MIN	19	CFSM	.89	IN.	12.08
WTR YR 1968	TOTAL	21,299	MEAN	58.2	MAX	227	MIN	21	CFSM	.85	IN.	11.61

4-0971.95. Gourdneck Canal near Schoolcraft, Mich.

Location.--Lat 42°09'54", long 85°36'15", in NW¼ sec. 33, T.3 S., R.11 W., on right bank at downstream end of culvert on Osterhout Avenue, 3.8 miles northeast of Schoolcraft.

Records available.--October 1965 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 854.98 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources).

Extremes.--Maximum discharge during year, 13 cfs Dec. 22 (gage height, 1.96 ft); minimum, 0.2 cfs on many days during February and March; minimum gage height, 0.65 ft Sept. 18.

1966-68: Maximum discharge, 16 cfs Dec. 9-12, 1966, Apr. 17, 21-24, 28, 1967; maximum gage height, 2.79 ft Apr. 24, 1967; minimum discharge, 0.2 cfs on many days in February and March, 1968.

Remarks.--Records fair except those for the winter period, which are poor. Canal diverts water from Gourdneck Creek to West Lake to sustain lake levels.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.0	7.7	7.4	6.0	8.3	0.2	1.6	5.4	2.5	6.6	2.2	1.2
2	7.7	8.1	7.5	6.0	9.7	.2	1.4	5.1	2.4	6.1	2.2	1.3
3	7.5	8.3	7.0	6.0	8.7	.2	1.7	6.5	2.3	5.7	2.4	1.2
4	7.2	8.8	8.0	6.0	8.2	.2	2.5	7.6	2.1	5.3	2.2	1.3
5	7.0	9.2	8.0	6.0	7.8	.2	2.2	7.2	2.0	5.1	1.9	1.4
6	6.5	9.2	8.0	6.0	6.5	.2	2.0	6.6	1.9	5.1	2.0	1.3
7	6.1	9.1	8.2	6.0	6.0	.2	2.0	3.7	1.8	4.9	2.1	1.2
8	6.2	9.1	8.7	6.0	5.0	.2	1.6	5.4	1.7	4.6	2.2	1.1
9	6.7	9.2	8.6	5.8	4.0	.2	1.5	5.4	1.7	4.2	2.9	1.2
10	6.5	9.1	9.2	2.5	4.0	.2	2.5	5.0	1.6	3.8	2.8	1.2
11	6.4	9.2	10	.9	3.0	.2	3.8	4.9	1.6	3.4	2.5	1.4
12	6.2	8.4	12	.8	2.0	.2	3.8	3.9	1.4	3.3	2.1	1.4
13	6.0	7.7	12	.8	2.0	.2	3.7	2.5	1.2	2.9	2.1	1.5
14	6.0	7.5	12	.8	.9	.2	4.5	2.8	1.1	2.5	1.7	1.4
15	6.0	7.4	8.7	.8	.8	.3	5.6	2.8	1.0	2.5	1.6	1.4
16	6.7	7.4	6.7	.8	.7	.3	5.5	3.2	.96	2.4	1.7	1.3
17	6.7	7.8	6.6	.8	.6	.3	5.6	3.6	.88	2.1	2.1	1.3
18	6.8	8.0	6.6	.8	.5	.3	5.9	4.5	.84	2.0	2.1	1.4
19	6.7	7.8	6.7	.8	.4	4.0	5.9	5.0	.8	1.9	1.9	1.4
20	6.6	7.6	7.5	.8	.4	3.6	5.9	4.4	.72	1.8	1.8	1.4
21	6.0	7.6	11	.8	.4	3.6	6.0	3.2	.64	1.7	1.7	1.7
22	5.7	7.7	13	.8	.3	3.3	5.9	2.9	.64	1.5	1.7	1.9
23	5.7	7.7	12	.8	.3	3.1	6.0	2.8	.68	1.4	1.7	2.1
24	5.5	7.6	10	.8	.3	2.9	6.0	2.6	1.7	3.6	1.6	2.5
25	5.7	7.5	8.0	.8	.3	2.8	6.0	2.6	4.7	3.2	1.4	2.7
26	5.9	7.5	6.5	.8	.3	2.9	5.9	2.5	7.8	4.7	1.2	2.5
27	6.5	7.0	6.0	.8	.3	3.1	5.9	2.5	7.8	3.0	1.0	2.5
28	6.8	6.7	6.0	.8	.2	2.5	5.6	2.7	7.5	2.3	1.0	2.5
29	6.7	7.5	6.0	.8	.2	2.1	5.6	2.8	7.1	2.5	1.0	2.2
30	6.9	7.5	6.0	.8	------	1.9	5.4	2.8	6.9	2.6	1.0	2.1
31	7.1	------	6.0	.8	------	2.0	------	2.8	------	2.3	.96	------
TOTAL	202.0	240.9	259.9	73.2	82.1	41.8	127.5	125.7	75.96	105.0	56.76	49.0
MEAN	6.52	8.03	8.38	2.36	2.83	1.35	4.25	4.05	2.53	3.39	1.83	1.63
MAX	8.0	9.2	13	6.0	9.7	4.0	6.0	7.6	7.8	6.6	2.9	2.7
MIN	5.5	6.7	6.0	.8	.2	.2	1.4	2.5	.64	1.4	.96	1.1

CAL YR 1967 TOTAL 2,391.98 MEAN 6.55 MAX 16 MIN .35
WTR YR 1968 TOTAL 1,439.82 MEAN 3.93 MAX 13 MIN .2

4-0972. Gourdneck Creek near Schoolcraft, Mich.

Location.--Lat 42°09'20", long 85°36'48", in NE1/4 sec.5, T.4 S., R.11 W., on left bank at upstream side of bridge on Oakland Drive, 3.2 miles northeast of Schoolcraft.

Drainage area.--7.29 sq mi.

Records available.--January 1964 to September 1968.

Gage.--Water-stage recorder and concrete control. Datum of gage is 853.71 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to May 21, 1964, staff gage at same site and datum.

Extremes.--Maximum discharge during year, 29 cfs Feb. 2 (gage height, 1.83 ft); minimum, 0.21 cfs Dec. 15 (gage height, 1.03 ft).

1964-68: Maximum discharge, 29 cfs Apr. 13, 1965 (caused by release of water from storage above station), Feb. 2, 1968; maximum gage height, 1.83 ft Feb. 2, 1968; minimum discharge, 0.1 cfs Feb. 3-6, 1965 (gage height, 1.00 ft).

Remarks.--Records fair except those for the winter periods and those for period of no gage-height record, which are poor. Gourdneck canal diverts water from stream 100 ft above station to sustain lake levels (see station No. 0971.95). Figures of runoff have been adjusted since September 1965.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	2.9	2.3	.65	6.5	22	12	9.9	5.4	6.5	13	8.6	4.6
2	2.9	2.9	.65	6.1	26	12	13	5.4	6.0	12	8.1	5.0
3	2.9	3.1	.57	6.1	22	11	15	3.5	5.8	10	7.6	5.0
4	2.9	3.1	.57	5.7	21	11	18	2.3	5.7	9.9	7.2	5.0
5	2.6	3.4	.57	5.0	19	11	17	2.4	5.7	8.6	7.2	4.6
6	2.5	3.4	.57	5.0	18	11	15	2.7	5.4	8.1	6.8	4.6
7	2.5	2.9	.65	4.3	17	11	14	5.5	5.4	7.6	6.5	4.6
8	2.5	4.0	.65	3.6	17	12	13	3.6	5.4	7.2	7.2	4.6
9	2.5	3.1	.57	7.2	16	12	12	3.4	5.0	6.8	7.2	5.0
10	2.3	2.9	.73	8.5	15	12	10	3.1	4.6	6.5	6.8	5.0
11	2.1	3.4	1.3	10	15	12	7.5	2.9	4.6	6.1	6.5	5.4
12	2.1	3.4	2.9	10	14	11	7.0	4.0	4.3	5.7	6.8	5.0
13	2.1	2.6	2.5	10	13	9.9	9.5	5.0	4.0	5.4	6.8	5.0
14	2.0	2.5	2.1	10	13	13	12	5.7	3.6	5.4	6.5	5.4
15	2.1	1.9	2.3	10	13	12	10	6.1	3.6	5.7	6.1	5.0
16	2.3	1.9	5.7	10	13	12	10	7.6	3.6	5.7	6.1	5.0
17	2.5	2.0	5.7	10	12	13	10	6.8	3.6	5.7	6.5	5.0
18	2.3	2.3	5.7	10	12	13	9.3	5.2	3.6	5.7	6.8	5.4
19	2.1	2.0	5.4	10	11	6.8	9.0	4.5	3.4	5.7	6.8	5.7
20	2.0	1.7	5.4	10	12	7.2	8.6	5.1	3.1	5.7	6.5	6.1
21	1.9	1.6	15	10	11	8.6	8.1	5.9	3.1	5.4	5.7	5.7
22	1.9	1.6	19	10	11	9.0	8.0	6.1	3.4	5.0	5.7	6.1
23	1.9	1.4	15	10	11	9.9	7.4	5.9	3.6	6.1	5.7	6.1
24	2.0	1.3	15	10	11	9.9	6.9	5.9	4.3	12	5.7	7.6
25	2.0	1.2	14	10	11	10	6.6	5.5	10	12	5.4	7.6
26	1.9	1.1	13	10	11	11	6.3	7.5	18	10	5.4	7.6
27	1.9	.89	11	10	11	10	6.1	7.5	17	11	5.0	7.2
28	2.0	.81	9.9	10	12	12	6.0	7.2	16	11	5.0	7.2
29	2.0	.81	8.6	10	12	11	5.8	7.1	15	10	5.0	7.6
30	2.0	.73	8.1	10	------	10	6.5	6.6	13	9.4	5.0	7.2
31	2.0	------	7.6	10	------	9.9	------	6.5	------	9.0	4.6	------
TOTAL	69.6	66.24	181.38	268.0	422	336.2	297.5	161.9	196.3	247.4	196.8	170.9
MEAN	2.25	2.21	5.85	8.65	14.6	10.8	9.92	5.22	6.54	7.98	6.35	5.70
MAX	2.9	4.0	19	10	26	13	18	7.6	18	13	8.6	7.6
MIN	1.9	.73	.57	3.6	11	6.8	5.8	2.3	3.1	5.0	4.6	4.6
+	6.52	8.03	8.38	2.36	2.83	1.35	4.25	4.05	2.53	3.39	1.83	1.63
MEAN ‡	8.72	10.2	14.2	11.0	17.4	12.2	14.2	9.27	9.07	11.4	8.18	7.33
CFSM ‡	1.20	1.40	1.95	1.51	2.39	1.67	1.95	1.27	1.24	1.56	1.12	1.01
IN ‡	1.39	1.57	2.25	1.74	2.57	1.93	2.17	1.47	1.39	1.80	1.29	1.12

CAL YR 1967: TOTAL 1,664.46 MEAN 4.56 MAX 19 MIN .57 MEAN‡ 11.1 CFSM‡ 1.52 IN.‡ 20.70
WTR YR 1968: TOTAL 2,614.22 MEAN 7.14 MAX 26 MIN .57 MEAN‡ 11.1 CFSM‡ 1.52 IN.‡ 20.68

\+ Diversion (Gourdneck canal).
‡ Adjusted for diversion.
Note.--No gage-height record Apr. 2 to May 7.

4-0975. St. Joseph River at Three Rivers, Mich.

Location.--Lat 41°56'25", long 85°38'00", in S½ sec. 18, T.6 S., R.11 W., on right bank in Scidmore Park at Three Rivers, 250 ft downstream from Rocky River and at mile 112.

Drainage area.--1,350 sq mi.

Records available.--May 1953 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 781.34 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Nov. 20, 1962, graphic water-stage recorder at same site and datum.

Average discharge.--15 years, 954 cfs.

Extremes.--Maximum discharge during year, 4,910 cfs Feb. 5 (gage height, 8.40 ft); minimum, 213 cfs Oct. 8 (gage height, 2.15 ft); minimum daily discharge, 223 cfs Oct. .
1953-68: Maximum discharge, that of Feb. 5, 1968; minimum daily, 78 cfs Sept. 12, 1964.
Maximum discharge since at least 1918, 8,260 cfs Apr. 27, 1950 (gage height, 10.6 ft).

Remarks.--Records good. Flow regulated by powerplants above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	254	1,150	1,230	2,310	3,030	1,430	1,920	1,340	1,010	3,970	1,380	578
2	515	1,250	922	2,040	3,600	1,170	1,860	1,300	1,060	3,580	1,130	634
3	550	1,270	982	1,810	4,320	1,090	1,750	1,130	1,440	3,270	739	870
4	506	1,340	1,240	1,700	4,730	1,390	2,120	770	1,320	2,960	800	894
5	494	1,470	1,320	1,500	4,860	1,370	2,260	662	1,360	2,810	1,180	880
6	479	1,530	1,280	1,500	4,790	1,350	2,500	953	1,330	2,400	1,190	748
7	407	1,480	1,290	1,400	4,500	1,350	2,380	981	994	2,230	958	419
8	223	1,490	1,280	1,500	4,170	1,330	2,340	981	1,120	2,140	962	266
9	524	1,490	898	1,800	3,880	969	2,290	954	1,110	1,840	1,120	720
10	509	1,480	1,110	1,500	3,220	1,280	2,120	948	1,080	1,720	1,010	904
11	503	1,420	1,620	1,400	3,050	1,640	1,830	722	947	1,570	843	874
12	527	1,470	1,770	1,400	2,920	1,520	1,720	645	889	1,530	819	751
13	516	1,540	2,000	1,300	2,810	1,470	1,840	976	859	1,240	970	567
14	491	1,480	2,240	1,400	2,630	1,410	1,840	982	732	1,040	940	409
15	349	1,450	2,450	1,400	2,490	1,420	1,720	970	543	1,140	802	275
16	619	1,400	2,320	1,400	2,230	1,250	1,700	1,040	706	1,010	620	706
17	947	1,460	2,180	1,300	1,950	1,370	1,800	1,020	810	1,080	605	878
18	1,100	1,440	2,330	1,400	1,820	1,620	1,780	944	864	1,090	728	817
19	1,040	1,560	2,170	1,390	1,820	1,570	1,770	1,030	867	1,080	1,020	684
20	1,070	1,640	2,100	1,400	1,830	1,620	1,630	1,140	818	931	1,060	513
21	980	1,590	2,250	1,330	1,720	1,660	1,590	1,030	637	972	1,020	288
22	1,040	1,560	2,540	1,440	1,660	1,700	1,650	1,020	513	1,020	1,010	681
23	1,080	1,570	2,900	1,460	1,680	1,720	1,650	1,070	511	933	993	1,200
24	995	1,550	3,070	1,400	1,570	1,760	1,590	1,060	842	1,130	849	1,040
25	1,050	1,460	3,250	1,250	1,410	1,830	1,600	961	1,110	1,180	671	1,060
26	1,060	1,370	3,070	1,390	1,600	1,850	1,620	992	1,810	1,340	947	1,030
27	1,080	1,420	2,770	1,150	1,570	1,900	1,440	1,070	2,580	1,380	1,060	886
28	1,030	1,340	2,790	1,260	1,460	1,940	1,240	1,100	3,240	1,450	927	618
29	1,140	1,280	2,780	1,780	1,450	2,020	1,570	1,330	3,540	1,500	869	758
30	1,180	1,260	2,470	2,110	------	2,090	1,390	1,290	3,840	1,510	664	1,040
31	1,100	------	2,440	2,560	------	2,000	------	1,280	------	1,410	469	------
TOTAL	23,358	43,210	63,062	47,980	78,770	48,089	54,510	31,691	38,482	52,456	28,355	21,988
MEAN	753	1,440	2,034	1,548	2,716	1,551	1,817	1,022	1,283	1,692	915	733
MAX	1,180	1,640	3,250	2,560	4,860	2,090	2,500	1,340	3,840	3,970	1,380	1,200
MIN	223	1,150	898	1,150	1,410	969	1,240	645	511	931	469	266
CFSM	.56	1.07	1.51	1.15	2.01	1.15	1.35	.76	.95	1.25	.68	.54
IN.	.64	1.19	1.74	1.32	2.17	1.32	1.50	.87	1.06	1.45	.78	.61

CAL YR 1967 TOTAL 471,288 MEAN 1,291 MAX 3,620 MIN 160 CFSM .96 IN 12.98
WTR YR 1968 TOTAL 531,951 MEAN 1,453 MAX 4,860 MIN 223 CFSM 1.08 IN 14.65

4-0975.4 Prairie River near Nottawa, Mich.

Location.--Lat 41°53'18", long 85°24'34", in NW¼ SW¼ sec.6, T.7 S., R.9 W., on left bank 10 ft upstream from bridge on State Highway 78, 3.0 miles upstream from unnamed tributary, and 3.0 miles southeast of Nottawa.

Drainage area.--106 sq mi.

Records available.--October 1962 to September 1968.

Gage.--Digital water-stage recorder. Altitude of gage is 850 ft (from topographic map). Prior to May 14, 1968, graphic water-stage recorder at same site and datum.

Average discharge.--6 years, 76.1 cfs.

Extremes.--Maximum discharge during year, 467 cfs Feb. 4 (gage height, 5.49 ft); minimum, 35 cfs Oct. 8 (gage height, 2.46 ft). 1962-68: Maximum discharge, that of Feb. 4, 1968; minimum, 11 cfs Aug. 9, 10, Sept. 8, 9, 10, 1964; minimum gage height, 1.77 ft Aug. 9, 10, 1964.

Remarks.--Records good except those for winter period, which are poor.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	42	109	93	170	292	90	143	107	104	355	87	51
2	42	117	91	160	368	90	137	94	98	303	100	57
3	41	123	93	150	435	90	133	89	91	253	109	57
4	40	135	95	140	464	90	167	87	87	212	105	58
5	40	137	100	130	456	90	205	85	79	182	96	58
6	38	139	100	130	413	90	240	84	73	159	90	56
7	36	136	103	120	360	95	235	79	68	142	84	53
8	37	131	108	120	319	100	210	75	65	126	80	50
9	40	126	122	120	290	111	192	73	62	116	82	49
10	40	121	139	110	250	117	178	72	60	108	78	50
11	40	119	160	110	230	118	161	70	58	99	74	52
12	40	119	188	110	210	118	148	71	57	91	71	52
13	39	118	200	100	200	113	139	68	56	87	65	52
14	39	117	199	100	190	109	136	67	55	83	62	50
15	46	115	185	100	180	109	138	69	55	79	58	49
16	70	111	175	100	170	115	140	81	54	77	67	47
17	94	116	167	100	160	126	144	85	53	75	81	46
18	118	122	160	110	150	141	146	86	51	71	96	47
19	130	128	156	110	140	151	140	86	52	68	105	49
20	136	132	166	110	130	153	141	84	50	65	105	59
21	132	133	211	110	120	154	137	81	48	62	100	61
22	120	129	245	110	110	154	133	77	50	61	92	68
23	109	125	275	110	110	157	127	74	49	60	84	77
24	99	120	286	110	100	155	124	73	57	87	76	88
25	97	117	277	100	100	154	122	71	84	96	70	92
26	93	113	250	100	195	156	118	72	165	100	65	90
27	99	110	220	100	90	164	113	79	288	98	61	85
28	105	103	200	110	90	171	107	86	389	90	58	80
29	107	99	180	165	90	168	103	101	421	79	55	77
30	109	95	170	221	------	158	100	113	402	72	52	71
31	107	------	170	253	------	151	------	110	------	70	50	------
TOTAL	2,325	3,615	5,284	3,889	6,312	3,958	4,457	2,549	3,281	3,626	2,458	1,831
MEAN	75.0	121	170	125	218	128	149	82.2	109	117	79.3	61.0
MAX	136	139	286	253	464	171	240	113	421	355	109	92
MIN	36	95	91	100	90	90	100	67	48	60	50	46
CFSM	.71	1.14	1.61	1.18	2.05	1.20	1.40	.78	1.03	1.10	.75	.58
IN.	.82	1.27	1.85	1.36	2.21	1.39	1.56	.89	1.15	1.27	.86	.64

CAL YR 1967 TOTAL 36,217 MEAN 99.2 MAX 286 MIN 20 CFSM .94 IN 12.71
WTR YR 1968 TOTAL 43,585 MEAN 119 MAX 464 MIN 36 CFSM 1.12 IN 15.29

4-0985. Fawn River near White Pigeon, Mich.

Location.--Lat 41°47'00", long 85°35'00", in SW¼ sec.10, T.8 S., R.11 W., on right bank a quarter of a mile downstream from bridge on county highway, 3.1 miles east of White Pigeon and 3½ miles upstream from Sherman Mill Creek.

Drainage area.--192 sq mi.

Records available.--July 1903 to July 1904 (gage height and discharge measurements only), October 1957 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 805.4 ft above mean sea level, datum of 1929.

Average discharge.--11 years, 145 cfs.

Extremes.--Maximum discharge during year, 498 cfs Feb. 5 (gage height, 4.28 ft); minimum, 53 cfs Oct. 5 (gage height, 2.01 ft).
1957-68: Maximum discharge, 498 cfs Feb. 5, 1968 (gage height, 4.28 ft); maximum gage height, 4.65 ft Jan. 9, 1966 (backwater from ice); minimum discharge, 26 cfs Aug. 5, 1964; minimum gage height, 1.72 ft Jan. 10, Sept. 10, 1964.
A daily mean dischaege of 750 cfs occurred Mar. 15, 1904.

Remarks.--Records good except those for the winter periods, which are fair. Small diurnal fluctuation caused by powerplants above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	107	163	151	300	337	180	278	221	218	419	167	140
2	95	170	164	290	403	170	273	212	198	373	170	151
3	80	182	166	273	436	212	271	197	201	341	169	143
4	78	187	159	280	475	221	301	201	204	310	167	142
5	59	188	166	260	405	218	323	203	187	286	159	138
6	71	183	159	235	478	223	348	183	192	273	159	135
7	69	180	176	230	456	216	357	178	188	265	155	129
8	73	176	171	230	442	214	353	176	170	255	162	126
9	78	176	175	230	419	233	337	173	173	243	177	124
10	85	178	194	220	387	227	314	183	170	235	180	114
11	73	185	192	220	360	225	290	158	168	229	173	124
12	80	170	225	210	310	235	200	164	151	225	171	129
13	79	168	230	210	300	241	288	161	163	216	156	125
14	80	176	239	200	290	223	286	176	142	204	155	124
15	88	183	247	200	280	223	284	175	158	208	142	120
16	121	163	251	200	280	231	273	173	163	206	154	104
17	168	170	251	200	270	245	267	199	145	199	183	114
18	190	180	253	200	260	243	267	185	143	194	195	106
19	194	185	251	200	240	247	265	187	148	188	197	113
20	192	183	247	200	240	249	263	188	140	180	198	139
21	187	187	267	200	240	255	263	192	132	168	198	146
22	176	183	286	210	220	263	263	185	131	153	200	144
23	159	180	314	210	230	265	261	178	138	156	194	149
24	134	176	334	200	220	263	255	183	148	161	188	169
25	140	176	346	190	220	273	249	175	203	167	183	172
26	142	164	344	190	210	275	247	165	243	179	179	168
27	161	158	340	200	200	275	239	194	285	176	166	162
28	168	161	321	220	200	275	235	197	360	171	162	147
29	170	156	315	240	190	280	231	216	424	170	160	145
30	164	164	310	270	------	284	212	229	445	173	146	146
31	151	------	312	295	------	282	------	231	------	171	140	------
TOTAL	3,812	5,251	7,556	7,013	9,107	7,478	8,302	5,853	5,042	6,894	5,306	4,088
MEAN	123	175	244	226	314	241	280	189	168	222	171	136
MAX	194	188	346	300	405	284	357	231	445	419	200	172
MIN	59	156	150	190	190	170	212	158	131	153	140	104
CFSM	.64	.91	1.27	1.18	1.64	1.26	1.46	.98	1.03	1.16	.89	.71
IN.	.74	1.02	1.46	1.36	1.76	1.45	1.63	1.13	1.15	1.34	1.03	.79

CAL YR 1967 TOTAL 60,277 MEAN 165 MAX 346 MIN 42 CFSM .86 IN 11.68
WTR YR 1968 TOTAL 76,692 MEAN 210 MAX 495 MIN 59 CFSM 1.09 IN 14.86

4-0990. St. Joseph River at Mottville, Mich.

Location.--Lat 41°48'05", long 85°45'15", in SW¼ sec.6, T.8 S., R.12 W., Michigan meridian, on right bank 500 ft upstream from bridge on U.S. Highway 112 at Mottville, 0.4 mile downstream from Michigan Power Co. hydroelectric plant, 4 miles upstream from Pigeon River, and at mile 96.

Drainage area.--1,866 sq mi.

Records available.--October 1923 to September 1968. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Digital water-stage recorder. Datum of gage is 755.3 ft above mean sea level (Michigan Power Co. benchmark). Prior to Oct. 1, 1951, at site 0.4 mile upstream at datum 4.2 ft higher. Oct. 1, 1951, to Nov. 20, 1962, graphic water-stage recorder at present site and datum.

Average discharge.--45 years,1,481 cfs.

Extremes.--Maximum discharge during year, 5,940 cfs Feb. 5 (gage height, 7.60 ft); minimum, 435 cfs Oct. 2 (gage height, 1.93 ft); minimum daily, 541 cfs Oct. 7.

1923-68: Maximum discharge, 10,700 cfs Apr. 27, 1950 (gage height, 6.56 ft, site and datum then in use); minimum daily, 39 cfs Oct. 19, 1963.

Remarks.--Records good except those for the winter periods, which are fair. Flow regulated by powerplants above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	571	1,560	1,740	3,170	3,010	2,000	2,520	1,320	1,660	4,610	1,770	986
2	774	1,750	1,470	2,700	3,500	1,900	2,450	1,790	1,410	4,510	1,740	1,070
3	845	1,800	1,320	2,450	4,500	1,700	2,380	1,750	1,530	4,070	1,340	1,440
4	872	1,800	1,660	2,200	5,380	1,800	2,360	1,340	1,860	3,820	1,140	1,300
5	866	1,810	1,640	2,100	5,850	1,900	2,730	1,180	1,760	3,470	1,500	1,210
6	845	1,960	1,780	2,000	5,830	1,900	2,820	1,320	1,760	3,360	1,550	1,110
7	541	2,050	1,650	2,000	5,670	1,800	3,180	1,430	1,600	2,780	1,470	755
8	622	1,800	1,770	2,100	5,230	1,800	2,380	1,230	1,440	2,800	1,400	713
9	834	2,020	1,660	2,600	5,000	1,800	2,350	1,320	1,350	2,620	1,730	1,080
10	926	1,910	1,060	2,000	4,700	1,600	2,930	1,470	1,760	2,460	1,600	1,130
11	847	2,080	2,110	2,000	4,300	2,000	2,800	1,260	1,330	2,320	1,240	1,210
12	850	1,700	2,280	1,900	4,000	2,200	2,620	785	1,330	2,070	1,380	1,230
13	834	2,070	2,300	1,800	3,500	2,120	2,350	1,460	1,180	1,970	1,290	1,210
14	556	1,980	2,550	1,900	3,300	1,980	2,300	1,470	1,210	1,550	1,330	685
15	1,010	1,870	2,750	1,900	3,000	2,000	2,430	1,250	830	1,590	1,300	620
16	1,160	1,850	2,970	1,900	2,800	1,870	2,390	1,480	904	1,610	1,330	1,100
17	1,210	1,970	2,720	1,800	2,590	1,860	2,300	1,700	1,380	1,550	1,060	1,170
18	1,660	1,870	2,690	1,900	2,550	2,110	2,330	1,280	1,290	1,470	930	1,170
19	1,490	1,830	2,800	1,900	2,500	2,200	2,340	1,310	1,240	1,580	1,050	1,190
20	1,660	2,160	2,560	1,910	2,500	2,150	2,380	1,550	1,220	1,270	1,350	1,160
21	1,480	2,060	2,840	1,900	2,400	2,210	2,360	1,560	1,250	1,220	1,420	620
22	1,330	2,020	2,970	1,900	2,200	2,240	2,160	1,440	835	1,460	1,470	734
23	1,710	1,890	3,410	1,900	2,300	2,360	2,040	1,470	828	1,340	1,460	1,730
24	1,400	2,160	3,500	2,010	2,400	2,340	2,210	1,480	1,330	1,660	1,320	1,610
25	1,450	1,880	3,790	1,840	2,100	2,270	2,010	1,600	1,830	1,520	1,200	1,530
26	1,490	1,830	3,770	1,690	2,300	2,410	2,170	1,240	2,280	1,710	1,320	1,450
27	1,780	1,940	3,420	1,770	2,300	2,470	1,980	1,530	3,250	1,710	1,390	1,530
28	1,360	1,760	3,580	1,770	2,200	2,470	1,840	1,520	3,600	1,650	1,220	937
29	1,620	1,710	3,560	2,000	2,100	2,530	1,970	1,670	4,110	1,960	1,200	1,150
30	1,510	1,720	3,530	2,490	------	2,580	1,910	1,800	4,350	1,830	1,270	1,510
31	1,720	------	3,170	2,660	------	2,610	------	1,770	------	1,820	740	------
TOTAL	35,823	56,930	79,110	64,340	100,070	65,080	72,250	45,435	51,996	69,360	41,510	34,340
MEAN	1,156	1,898	2,552	2,075	3,451	2,099	2,408	1,466	1,733	2,237	1,339	1,145
MAX	1,780	2,160	3,790	3,170	5,850	2,610	3,180	1,920	4,350	4,610	1,770	1,730
MIN	541	1,560	1,060	1,690	2,100	1,600	1,840	785	828	1,220	740	620
CFSM	.62	1.02	1.37	1.11	1.85	1.12	1.29	.79	.93	1.20	.72	.61
IN.	.71	1.13	1.58	1.28	1.99	1.30	1.44	.91	1.04	1.38	.83	.68

CAL YR 1967 TOTAL 624,685 MEAN 1,711 MAX 4,280 MIN 400 CFSM .92 IN 12.45
WTR YR 1968 TOTAL 716,244 MEAN 1,957 MAX 5,850 MIN 541 CFSM 1.05 IN 14.27

4-0995. Pigeon Creek at Hogback Lake Outlet near Angola, Ind.

Location.--Lat 41°37'24", long 85°05'44", in NE¼NW¼ sec. 36, T. 37 N., R.12 E., on right bank 200 ft north of lake outlet, 2 miles southeast of Flint, and 5.1 miles west of Angola.

Drainage area.--102 sq mi.

Records available.--October 1945 to September 1968. Prior to October 1947, published as "near Flint."

Gage.--Water-stage recorder. Datum of gage is 940.00 ft above mean sea level, datum of 1929. Prior to October 1947, wire-weight gage at site 1½ miles downstream at different datum. October 1947 to Aug. 3, 1953, staff gage at site 600 ft downstream at same datum.

Average discharge.--23 years, 72.7 cfs.

Extremes.--Maximum discharge during year, 395 cfs Feb. 6, 7 (gage height, 14.00 ft); minimum, 11 cfs Oct. 1 (gage height, 8.11 ft). 1945-68: Maximum discharge, 744 cfs Apr. 8, 1950 (gage height, 14.95 ft); minimum, 3.4 cfs Oct. 25-27, 1964; minimum gage height, 7.24 ft Sept. 9, 10, 1953.

Remarks.--Record good.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11	24	45	290	229	64	164	74	100	134	71	35
2	12	25	45	265	286	62	156	72	101	132	70	36
3	12	26	47	235	333	61	150	70	100	123	69	35
4	12	30	47	205	365	60	151	67	96	114	67	34
5	12	34	48	185	384	59	156	65	90	103	65	33
6	12	36	51	165	394	58	164	63	84	94	62	32
7	12	40	56	150	394	58	170	60	80	86	59	31
8	12	42	62	140	383	58	170	58	75	79	57	30
9	12	42	71	125	366	60	167	57	71	76	57	30
10	12	43	84	115	335	61	158	56	67	78	55	29
11	12	43	102	112	315	62	149	55	64	76	54	28
12	12	43	133	104	290	65	139	54	61	73	52	28
13	12	43	168	98	270	67	127	53	58	69	50	28
14	12	43	199	95	250	67	121	53	55	67	47	27
15	13	42	231	92	215	68	117	52	53	65	44	26
16	15	42	239	88	190	74	114	55	51	63	46	26
17	17	43	239	84	175	86	112	58	48	61	52	25
18	19	45	233	81	155	104	109	61	46	58	56	26
19	22	46	223	79	140	126	106	65	45	57	60	26
20	23	49	207	78	125	136	103	66	43	57	63	26
21	24	52	207	76	115	141	100	67	41	55	63	26
22	24	53	247	75	105	145	98	67	40	53	62	26
23	24	55	282	74	95	147	95	66	40	51	59	27
24	24	55	318	74	88	146	91	65	43	55	56	28
25	24	54	336	72	80	144	88	64	49	61	53	27
26	24	54	355	70	75	146	85	63	61	70	50	27
27	24	52	360	69	70	154	83	66	77	77	46	26
28	24	50	360	73	68	163	81	72	98	78	44	24
29	24	48	360	87	66	168	78	80	116	77	40	24
30	24	47	350	123	------	170	76	86	129	74	38	22
31	24	------	325	172	------	169	------	94	------	71	36	------
TOTAL	540	1,301	6,030	3,751	6,356	3,149	3,678	2,004	2,082	2,387	1,703	848
MEAN	17.4	43.4	195	121	219	102	123	64.6	69.4	77.0	54.9	28.3
MAX	24	55	360	290	394	170	170	94	129	134	71	36
MIN	11	24	45	69	66	58	76	52	40	51	36	22
CFSM	.17	.43	1.91	1.19	2.15	1.00	1.20	.63	.68	.75	.54	.28
IN.	.20	.47	2.20	1.37	2.32	1.15	1.34	.73	.76	.87	.62	.31

CAL YR 1967	TOTAL	26,715.0	MEAN	73.2	MAX	360	MIN	5.2	CFSM	.72	IN	9.74
WTR YR 1968	TOTAL	33,829	MEAN	92.4	MAX	394	MIN	11	CFSM	.91	IN	12.33

4-1002.2. North Branch Elkhart River near Cosperville, Ind.

Location.--Lat 41°29'32", long 85°26'54", in SW¼NE¼ sec. 14, T. 35 N., R. 9 E., at downstream side of county road bridge over outlet of Waldron Lake at extreme west end of lake, 1.5 miles northeast of Cosperville, and 6.6 miles northwest of Albion.

Drainage area.--133 sq mi.

Records available.--October 1950 to September 1968.

Gage.--Wire-weight gage read twice daily. Datum of gage is 880.00 ft above sea level, datum of 1929. Prior to Aug. 7, 1956, staff gage at same site and datum.

Average discharge.--18 years, 108 cfs.

Extremes.--Maximum discharge during year, 394 cfs Feb. 4-6; maximum gage height, 8.49 ft June 29; minimum, 15 cfs Oct. 1, 2 (gage height, 4.75 ft).
1950-68: Maximum discharge observed, 717 cfs May 13, 1956 (gage height, 8.78 ft); minimum, 2.2 cfs Sept. 17, 18, 21, 1959; minimum gage height, 4.43 ft Aug. 11, Sept. 17, 1964.

Remarks.--Record good.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	55	55	242	230	109	183	109	124	364	79	59
2	16	65	58	230	319	109	183	109	124	349	74	61
3	19	69	69	218	379	104	172	104	124	334	69	57
4	20	79	74	206	394	99	194	99	119	306	65	56
5	23	79	79	194	394	99	206	94	114	293	65	57
6	23	79	84	183	394	104	206	89	114	280	61	53
7	22	74	94	180	379	104	206	84	109	267	58	51
8	24	69	99	172	379	104	206	79	104	242	57	47
9	24	69	104	161	349	114	194	79	99	230	55	47
10	22	66	109	161	334	119	183	79	94	218	53	47
11	22	67	134	150	306	119	183	79	89	194	49	45
12	20	69	161	139	293	119	172	79	79	183	45	45
13	20	69	183	129	280	114	161	74	69	172	42	44
14	21	68	183	119	267	109	161	74	63	150	40	44
15	27	67	183	109	242	109	161	69	55	144	38	42
16	46	63	183	99	230	139	161	84	50	134	69	40
17	61	66	183	89	218	161	150	94	43	124	99	38
18	69	69	172	79	194	172	150	94	36	119	114	40
19	74	74	172	69	183	172	150	99	35	109	114	43
20	69	74	172	66	172	183	150	94	31	109	109	44
21	65	74	194	63	161	183	144	89	26	99	99	44
22	62	74	280	61	150	183	139	84	43	94	94	44
23	57	69	306	61	144	172	134	89	49	89	89	45
24	54	69	319	55	134	183	129	84	109	104	84	45
25	54	68	334	51	129	183	124	84	194	104	79	45
26	51	66	319	45	119	194	124	84	293	99	74	44
27	57	63	306	45	119	206	119	109	349	94	69	42
28	58	61	293	65	114	194	119	119	364	89	65	42
29	57	57	280	129	114	206	119	124	379	84	62	38
30	53	58	267	183	------	194	114	124	364	79	59	37
31	53	------	254	206	------	194	------	124	------	74	57	------
TOTAL	1,258	2,049	5,703	3,959	7,120	4,554	4,797	2,879	3,845	5,330	2,186	1,386
MEAN	40.6	68.3	184	128	246	147	160	92.9	128	172	70.5	46.2
MAX	74	79	334	242	394	206	206	124	379	364	114	61
MIN	15	55	55	45	114	99	114	69	26	74	38	37
CFSM	.31	.51	1.38	.96	1.85	1.10	1.20	.70	.96	1.29	.53	.35
IN.	.35	.57	1.59	1.11	1.99	1.27	1.34	.81	1.08	1.49	.61	.39

CAL YR 1967	TOTAL	37,044.4	MEAN	101	MAX	334	MIN	3.5	CFSM	.76	IN	10.36
WTR YR 1968	TOTAL	45,066	MEAN	123	MAX	394	MIN	15	CFSM	.93	IN	12.60

4-1005. Elkhart River at Goshen, Ind.

Location.--Lat 41°35'36", long 85°50'55", near line between secs. 8 and 9, T. 36 N., R.6 E., on right bank 20 ft downstream from River Avenue Bridge at Goshen and half a mile upstream from Rock Run.

Drainage area.--580 sq mi.

Records available.--April 1931 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 769.43 ft above mean sea level, datum of 1929. Prior to Nov. 20, 1931, chain gage at same site and datum. Prior to Nov. 15, 1965, graphic water-stage recorder at same site and datum.

Average discharge.--37 years, 497 cfs.

Extremes.--Maximum discharge during year, 4,010 cfs Feb. 2 (gage height, 8.81 ft); minimum, 115 cfs Oct. 8, 9 (gage height, 1.90 ft). 1931-68: Maximum discharge, 5,440 cfs Apr. 4, 1950 (gage height, 10.15 ft); maximum gage height, 10.33 ft July 10, 1951; minimum discharge, 6.6 cfs Aug. 11, 1964 (gage height, 1.38 ft).

Remarks.--Record good. The flow is regulated by three powerplants above station. Record of suspended sediment loads for the water year 1968 is published in Part 2 of the Indiana report.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	140	315	317	1,160	1,930	544	738	558	536	1,710	379	280
2	140	437	310	1,060	3,470	532	710	538	559	1,600	358	295
3	137	517	356	1,000	3,520	503	723	513	556	1,500	337	276
4	133	524	402	1,190	2,650	502	1,630	507	528	1,420	327	263
5	125	541	411	981	2,240	508	2,190	482	508	1,340	321	278
6	124	470	448	749	2,040	523	1,600	458	480	1,260	321	272
7	119	440	592	879	1,930	529	1,200	437	459	1,180	307	250
8	118	419	636	862	1,850	539	1,020	422	441	1,100	315	241
9	120	402	592	765	1,770	595	919	426	417	1,110	326	242
10	146	392	673	717	1,530	620	849	412	379	1,230	320	234
11	156	388	1,100	727	1,540	600	794	398	362	1,210	297	247
12	141	411	1,430	750	1,460	583	752	391	350	997	278	243
13	146	433	1,440	611	1,390	558	722	371	333	877	268	235
14	140	413	1,190	599	1,410	526	722	360	320	802	260	229
15	149	388	988	589	1,280	533	769	352	313	745	266	216
16	175	370	899	535	1,190	854	738	417	301	691	538	216
17	292	397	860	510	1,120	1,240	703	448	288	644	783	215
18	364	514	844	496	1,090	969	693	435	277	595	693	232
19	347	531	839	480	981	877	670	440	271	563	590	259
20	325	456	829	492	918	833	663	440	282	523	518	273
21	295	421	1,190	504	899	809	663	426	291	474	474	263
22	287	410	2,210	509	867	810	634	422	318	444	441	280
23	263	407	2,230	503	818	812	616	440	347	424	421	265
24	256	396	1,680	455	708	789	600	448	1,250	523	399	273
25	261	384	1,430	444	653	857	584	430	2,610	524	355	271
26	263	372	1,300	443	629	936	573	435	3,030	442	334	255
27	288	359	1,210	461	626	931	587	505	2,800	405	320	247
28	325	342	1,230	731	593	862	574	550	2,380	386	310	234
29	341	317	1,220	1,380	567	814	559	555	2,040	362	294	216
30	310	313	1,180	1,810	------	779	556	550	1,800	343	282	225
31	292	------	1,180	1,770	------	758	------	534	------	365	263	------
TOTAL	6,718	12,479	31,216	24,162	41,669	22,125	24,751	14,100	24,826	25,789	11,695	7,525
MEAN	217	416	1,007	779	1,437	714	825	455	828	832	377	251
MAX	364	541	2,230	1,810	3,520	1,240	2,190	558	3,030	1,710	783	295
MIN	118	313	310	443	567	502	556	352	271	343	260	215
CFSM	.37	.72	1.74	1.34	2.48	1.23	1.42	.78	1.43	1.43	.65	.43
IN.	.43	.80	2.00	1.55	2.67	1.43	1.59	.90	1.59	1.65	.75	.48

CAL YR	1967	TOTAL	196,842	MEAN	539	MAX	2,310	MIN	88	CFSM	.93	IN 12.62
WTR YR	1968	TOTAL	247,055	MEAN	675	MAX	3,520	MIN	118	CFSM	1.16	IN 15.84

PEAK DISCHARGE (BASE, 1,800 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-22	2130	6.59	2,490	04-05	0830	6.21	2,310
02-02	2000	8.81	4,010	06-26	0530	7.62	3,130

GPO 817-436-7

4-1010. St. Joseph River at Elkhart, Ind.

Location.--Lat 41°41'30", long 85°58'30", in NE¼ sec. 5, T. 37 N., R. 5 E., on left bank 200 ft downstream from mouth of Elkhart River, 200 ft upstream from Main Street Bridge in Elkhart, 2,000 ft downstream from Christiana Creek, and ½ mile downstream from Elkhart Hydroelectric Plant.

Drainage area.--3,339 sq mi.

Records available.--August 1947 to September 1968. Gage heights at site three-quarters of a mile downstream at different datum for September 1924 to March 1926 are available in the district office.

Gage.--Digital water-stage recorder. Datum of gage is 700.00 ft above mean sea level, datum of 1929. Prior to Nov. 15, 1962, graphic water-stage recorder at same site and datum.

Average discharge.--21 years, 2,960 cfs.

Extremes.--Maximum discharge during year, 12,400 cfs Feb. 4 (gage height, 24.80 ft); minimum daily, 1,140 cfs Oct. 7.
1947-68: Maximum discharge, 18,400 cfs Apr. 5, 1950 (gage height, 27.82 ft); minimum daily, 336 cfs Aug. 5, 1964.

Remarks.--Record good. The flow is regulated by Elkhart Hydroelectric Plant, 2,400 ft upstream, and by a hydroelectric plant on Elkhart River at Goshen.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.360	2.890	2.940	5.350	7.630	3.900	4.800	3.600	3.280	8.610	3.230	1.960
2	1.170	3.160	2.840	4.810	10.400	3.870	4.640	3.450	3.180	8.440	3.090	2.180
3	1.500	3.470	2.540	5.060	12.100	3.590	4.630	3.280	3.000	7.750	2.800	2.410
4	1.550	3.520	2.790	4.520	11.600	3.420	5.810	3.000	3.570	7.210	2.420	2.540
5	1.550	3.550	2.900	4.440	11.100	3.720	7.210	2.630	3.290	6.710	2.670	2.320
6	1.480	3.620	3.160	4.430	10.700	3.750	6.670	2.740	3.160	6.410	2.720	2.290
7	1.140	3.470	3.180	4.090	10.200	3.740	6.420	2.840	3.090	5.610	2.580	1.700
8	1.250	3.570	3.390	4.420	9.790	3.760	5.930	2.810	2.780	5.530	2.560	1.690
9	1.480	3.320	3.390	4.570	9.270	3.810	5.660	2.550	2.530	5.280	2.960	2.010
10	1.550	3.410	3.150	4.590	8.420	3.520	5.320	2.730	3.010	5.010	2.990	2.150
11	1.540	3.550	4.060	4.480	6.950	4.000	5.300	2.650	2.760	4.880	2.430	2.150
12	1.500	3.230	5.480	4.330	7.630	4.380	4.960	2.310	2.400	4.500	2.730	2.170
13	1.510	3.540	5.590	4.240	7.160	4.010	4.600	2.500	2.440	4.120	2.430	2.110
14	1.180	3.490	5.480	4.010	7.060	3.830	4.470	2.790	2.310	3.490	2.430	1.590
15	1.740	3.380	5.420	3.940	6.710	3.750	4.670	2.720	2.050	3.450	2.420	1.540
16	2.290	3.160	5.510	3.790	6.280	4.330	4.590	2.800	2.330	3.390	2.790	1.800
17	2.230	3.370	5.370	3.630	5.700	4.730	4.460	3.080	3.350	3.220	2.980	2.000
18	2.820	3.650	5.050	3.640	5.360	4.690	4.450	2.940	2.600	3.110	2.940	2.070
19	2.950	3.620	5.180	3.720	5.230	4.790	4.440	2.790	2.370	3.160	3.240	2.140
20	2.740	3.730	5.000	3.750	5.340	4.670	4.820	2.990	2.320	2.750	3.460	2.130
21	2.860	3.610	5.670	3.670	4.680	4.720	4.550	3.000	2.340	2.690	2.980	1.640
22	2.350	3.550	7.470	3.710	4.650	4.600	4.250	2.930	2.340	2.750	3.010	1.640
23	3.130	3.470	7.830	3.830	4.630	4.760	4.060	2.880	2.470	2.750	2.870	2.500
24	2.770	3.550	7.400	3.630	4.760	4.750	3.960	3.050	3.580	3.060	2.580	2.960
25	2.570	3.400	7.250	3.400	4.350	4.680	3.940	3.090	4.890	3.440	2.530	2.280
26	2.520	3.310	7.130	3.480	3.890	5.040	3.800	2.620	7.490	3.120	2.360	2.420
27	2.940	3.260	6.460	3.460	4.330	5.080	3.960	3.040	8.770	3.400	2.570	2.440
28	2.870	3.140	6.150	4.080	4.240	5.020	3.410	3.150	8.540	3.180	2.520	2.240
29	2.770	3.010	6.680	5.170	3.970	4.940	3.250	3.210	8.920	3.290	2.310	1.590
30	2.730	2.950	6.180	6.560	------	4.940	3.590	3.600	8.690	3.180	2.330	2.290
31	2.640	------	6.010	6.790	------	4.930	------	3.400	------	3.190	1.790	------
TOTAL	64.680	101.950	156.650	133.590	204.130	133.720	142.620	91.170	113.850	136.680	83.720	62.950
MEAN	2,086	3,398	5,053	4,309	7,039	4,314	4,754	2,941	3,795	4,409	2,701	2,098
MAX	3,130	3,730	7,830	6,790	12,100	5,080	7,210	3,600	8,920	8,610	3,460	2,960
MIN	1,140	2,890	2,540	3,400	3,890	3,420	3,250	2,310	2,050	2,690	1,790	1,540
CFSM	.62	1.02	1.51	1.29	2.11	1.29	1.42	.88	1.14	1.32	.81	.63
IN.	.72	1.14	1.74	1.49	2.27	1.49	1.59	1.02	1.27	1.52	.93	.70

CAL YR 1967	TOTAL 1,188,485	MEAN 3,256	MAX 8,100	MIN 810	CFSM .98	IN 13.24
WTR YR 1968	TOTAL 1,425,710	MEAN 3,895	MAX 12,100	MIN 1,140	CFSM 1.17	IN 15.88

4-1015. St. Joseph River at Niles, Mich.

Location.--Lat 41°49'45", long 84°15'35", in SW¼ sec.26, T.7 S., R.17 W., on right bank 100 ft upstream from Main Street Bridge at Niles, 0.6 mile downstream from dam of French Paper Co., 1 mile upstream from Dowagiac River, and at mile 44.

Drainage area.--3,666 sq mi.

Records available.--October 1930 to September 1968. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Digital water-stage recorder. Datum of gage is 635.02 ft above mean sea level, datum of 1929. Oct. 1, 1930, to Feb. 11, 1931, tape gage on Main Street Bridge, and Feb. 12 to June 30, 1931, staff gage 50 ft upstream from present site (gage heights referred to mean sea level). July 1, 1931, to Nov. 20, 1962, graphic water-stage recorder at present site and datum. Since Oct. 1, 1943, auxiliary gage is headwater gage at hydroelectric plant at Buchanan Dam, 8 miles downstream.

Average discharge.--38 years, 3,066 cfs.

Extremes.--Maximum discharge during year, 13,800 cfs Feb. 3 (gage height, 10.10 ft); minimum daily discharge, 1,020 cfs Oct. 2.
1930-68: Maximum discharge, 20,200 cfs Apr. 5, 1950 (gage height, 13.10 ft); minimum daily, 420 cfs Aug. 30, 1931.

Remarks.--Records good. Flow regulated by powerplants above station.

Cooperation.--Gage-height record at auxiliary gage furnished by Indiana and Michigan Electric Co.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1,130	3,250	2,940	5,070	8,030	3,410	4,900	3,430	3,520	8,500	3,100	2,080
2	1,020	3,170	2,990	5,520	11,900	3,960	4,520	3,530	3,260	8,000	3,490	2,380
3	1,230	3,630	2,580	4,950	13,600	3,590	4,540	3,140	2,790	7,600	3,230	2,420
4	1,740	3,790	2,940	4,270	13,000	3,370	5,820	3,070	3,370	7,200	2,700	2,570
5	1,840	3,740	2,760	4,500	12,100	3,710	8,490	2,680	3,090	6,700	2,720	2,560
6	2,030	3,550	3,020	4,080	11,500	3,740	6,950	2,620	3,670	6,400	3,080	2,460
7	1,880	3,600	3,190	4,070	11,000	3,710	6,440	2,720	2,670	6,000	3,010	2,430
8	1,520	3,430	3,210	4,400	10,300	3,750	6,290	3,190	3,070	5,600	2,960	1,700
9	1,660	3,310	3,400	5,360	9,870	4,110	5,680	2,130	2,810	5,300	3,350	1,890
10	1,930	3,500	3,510	4,830	8,850	3,980	5,140	2,900	2,810	5,000	3,580	2,320
11	1,920	3,560	3,490	4,150	7,500	3,760	5,200	2,840	2,870	4,840	2,880	2,460
12	1,900	3,380	5,880	4,360	6,960	4,400	4,970	2,510	2,800	4,490	2,510	2,460
13	1,860	3,410	6,120	4,020	7,790	4,000	4,710	2,510	2,700	4,230	2,760	2,280
14	1,780	3,430	5,760	3,780	6,760	3,970	4,500	2,920	2,500	4,270	2,660	2,270
15	2,100	3,430	5,590	3,900	6,760	3,690	4,590	2,870	2,400	2,940	2,550	1,830
16	3,020	3,820	5,090	3,950	6,450	4,270	4,950	2,770	2,200	3,680	2,940	1,800
17	2,670	3,010	5,250	3,580	6,100	4,870	4,250	3,160	2,200	3,520	3,290	2,310
18	2,980	3,770	5,090	3,680	4,850	4,620	4,550	3,130	2,700	3,490	3,310	2,350
19	3,440	3,700	4,920	3,660	5,550	4,920	4,330	2,870	2,700	3,300	3,220	2,330
20	2,900	3,620	5,050	3,810	4,980	4,630	4,640	2,940	2,500	3,100	3,660	2,620
21	3,350	3,550	5,720	3,630	4,850	4,780	4,590	3,030	2,400	2,860	3,300	2,130
22	2,420	3,510	8,880	3,560	4,400	4,660	4,250	2,890	2,400	3,170	3,160	2,670
23	3,030	3,510	8,850	3,890	4,530	4,520	4,200	2,930	2,100	2,880	3,100	2,720
24	2,840	3,200	8,310	3,680	4,790	4,740	3,840	3,100	2,100	3,080	2,710	3,570
25	2,810	3,410	7,420	3,480	4,400	4,840	3,910	2,970	4,000	3,830	2,760	3,020
26	3,100	3,140	7,370	3,610	3,980	4,780	3,870	3,150	7,000	3,460	2,710	2,720
27	2,670	3,050	6,430	3,370	4,080	5,080	3,400	2,710	10,000	3,550	2,610	2,720
28	3,290	3,150	6,440	4,050	4,250	4,860	3,570	3,220	10,400	3,300	2,670	2,700
29	2,750	3,310	6,580	5,510	4,630	4,990	3,170	3,290	9,700	3,460	2,420	2,880
30	3,020	2,740	6,280	7,340	------	4,650	3,380	3,450	9,000	3,260	2,490	1,400
31	2,660	------	6,290	7,600	------	4,840	------	3,280	------	3,530	2,440	------
TOTAL	72,490	102,670	161,350	135,660	213,760	133,200	143,640	91,950	115,730	140,540	91,370	72,050
MEAN	2,338	3,422	5,205	4,376	7,371	4,297	4,788	2,966	3,858	4,534	2,947	2,402
MAX	3,440	3,820	8,880	7,600	13,600	5,080	8,490	3,530	10,400	8,500	3,660	3,570
MIN	1,020	2,740	2,580	3,370	3,980	3,370	3,170	2,130	2,100	2,860	2,420	1,400
CFSM	.64	.93	1.42	1.19	2.01	1.17	1.31	.81	1.05	1.24	.80	.66
IN.	.74	1.04	1.64	1.38	2.17	1.35	1.46	.93	1.17	1.43	.93	.73

CAL YR 1967 TOTAL 1,270,295 MEAN 3,480 MAX 9,530 MIN 881 CFSM .95 IN 12.89
WTR YR 1968 TOTAL 1,474,410 MEAN 4,028 MAX 13,600 MIN 1,020 CFSM 1.10 IN 14.96

STREAMS TRIBUTARY TO LAKE MICHIGAN

4-1018. Dowagiac River at Sumnerville, Mich.

Location.—Lat 41°54'57", long 86°12'47", in SE¼ sec. 30, T.6 S., R.16 W., on right bank 30 ft upstream from bridge on Indian Lake Road, half a mile west of Sumnerville.

Drainage area.—255 sq mi.

Records available.—October 1960 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 692.62 ft above mean sea level, datum of 1929. Prior to May 14, 1968, graphic water-stage recorder at same site and datum.

Average discharge.—8 years, 245 cfs.

Extremes.--Maximum discharge during year, 1,280 cfs June 26 (gage height, 8.78 ft); minimum, 149 cfs Aug. 31 (gage height, 3.26 ft); 1960-68: Maximum discharge, that of June 26, 1968; minimum, 86 cfs Sept. 10, 1964; minimum gage height, 2.57 ft Aug. 8, 9, 1964.

Remarks.—Records good except those for winter period and those for period of no gage-height record, which are fair. Flow regulated by millpond and lake level control dam above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	258	420	302	305	725	265	279	290	263	474	231	164
2	238	530	302	322	1,060	265	295	290	255	416	218	185
3	246	506	288	349	996	260	300	290	203	374	209	178
4	249	496	262	332	785	260	310	290	247	344	206	170
5	233	446	313	307	645	265	320	290	252	336	206	167
6	246	428	329	330	606	270	330	290	242	322	218	164
7	238	450	341	284	550	280	330	290	239	303	250	160
8	214	406	347	276	528	310	330	285	218	295	250	156
9	200	386	320	336	446	337	320	278	178	288	244	163
10	257	376	315	322	434	466	310	249	179	276	233	184
11	262	430	404	312	426	442	300	254	188	270	218	200
12	260	424	614	302	420	442	280	218	203	266	208	188
13	204	400	614	303	404	400	280	220	194	456	200	182
14	194	410	514	273	394	378	280	278	196	276	194	176
15	218	394	444	279	386	372	290	285	208	249	188	169
16	332	370	380	285	374	380	290	322	206	231	205	164
17	394	456	339	290	334	388	300	302	212	225	236	170
18	349	450	339	300	296	378	300	236	252	231	228	190
19	359	406	386	324	290	374	310	247	263	255	215	206
20	337	390	372	322	285	384	320	260	252	236	206	209
21	313	402	558	313	280	370	325	295	223	222	196	203
22	252	369	727	271	275	367	320	279	211	214	190	241
23	234	341	590	260	270	352	315	279	193	209	184	270
24	286	324	474	250	270	356	310	281	225	372	179	262
25	332	325	456	260	270	396	310	252	520	408	170	266
26	334	313	438	260	270	390	305	208	1,210	310	167	250
27	382	308	436	265	270	372	300	241	1,190	268	167	230
28	500	329	402	337	270	351	300	283	942	257	163	214
29	414	310	378	534	270	334	300	278	711	246	160	203
30	370	307	361	729	------	322	300	252	564	236	156	200
31	420	------	327	616	------	307	------	226	------	233	154	------
TOTAL	9,125	11,902	12,672	10,248	12,829	10,833	9,159	8,338	10,439	9,098	6,249	5,884
MEAN	294	397	409	331	442	349	305	269	348	293	202	196
MAX	500	530	727	729	1,060	466	330	322	1,210	474	250	270
MIN	194	307	262	250	270	260	279	208	178	209	154	156
CFSM	1.15	1.56	1.60	1.30	1.73	1.37	1.20	1.05	1.36	1.15	.79	.77
IN.	1.33	1.74	1.85	1.49	1.87	1.58	1.34	1.22	1.52	1.33	.91	.86

CAL YR 1967 TOTAL 114,786 MEAN 314 MAX 769 MIN 121 CFSM 1.23 IN 16.74
WTR YR 1968 TOTAL 116,776 MEAN 319 MAX 1,210 MIN 154 CFSM 1.25 IN 17.03

Note.—No gage height record Apr. 2 to May 9.

4-1025. Paw Paw River at Riverside, Mich.

Location.—Lat 42°11'08", long 86°22'10", in NE¼ sec. 26, T.3 S., R.18 W., on right bank 200 ft downstream from county highway bridge three-quarters of a mile east of Riverside. Prior to May 10, 1966, at site 250 ft upstream.

Drainage area.--390 sq mi.

Records available.—October 1951 to September 1968.

Gage.—Water-stage recorder. Datum of gage is 588.80 ft above mean sea level, datum of 1929. Prior to May 10, 1966 water-stage recorder at same site and datum. May 10, 1966 to Mar. 1, 1967, staff gage 250 ft downstream at same datum. Mar. 2 to July 11, 1967 wire-weight gage at same site and datum.

Average discharge.—16 years, 390 cfs.

Extremes.—Maximum discharge during year, 2,140 cfs Feb. 6 (gage height, 9.32 ft); minimum, 189 cfs Aug. 31 (gage height, 3.25 ft). 1951-68: Maximum discharge, 2,140 cfs Feb. 6, 1968 (gage height, 9.32 ft); minimum, 99 cfs July 5, 1964 (gage height, 2.66 ft).

Remarks.--Records good except those for the winter period, which are fair. Diurnal fluctuation, principally during low flow, caused by paper mill above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	353	534	408	697	850	400	568	394	319	815	410	212
2	347	584	396	620	1,120	400	543	377	315	835	356	238
3	342	646	389	560	1,400	400	525	368	313	840	315	251
4	333	685	380	520	1,550	406	531	365	309	800	285	282
5	282	721	301	500	1,780	408	562	355	304	720	285	279
6	217	710	300	480	1,910	422	571	344	294	651	280	275
7	213	700	360	460	1,620	430	563	341	281	549	280	252
8	208	700	375	460	1,380	454	568	331	280	467	280	221
9	234	714	384	450	1,200	521	547	319	285	383	290	248
10	256	714	399	450	1,100	602	545	300	279	332	282	320
11	265	714	432	440	950	657	513	300	283	314	277	363
12	277	710	523	440	850	678	473	302	276	304	273	332
13	288	714	664	430	740	699	447	305	273	288	271	306
14	298	700	749	430	660	732	434	313	275	273	256	280
15	306	685	724	420	620	748	441	318	274	268	237	229
16	336	670	721	420	560	728	447	323	273	240	271	244
17	348	667	732	410	520	702	455	335	268	237	364	283
18	355	673	749	410	480	672	482	333	266	239	337	285
19	383	673	742	420	460	657	503	344	271	243	329	301
20	452	643	707	430	450	660	521	351	271	247	321	296
21	477	605	770	420	430	666	555	354	271	251	312	273
22	467	584	914	410	420	645	555	351	268	248	304	257
23	440	572	898	410	420	639	507	347	240	243	282	286
24	418	556	846	410	410	628	478	343	259	382	214	338
25	417	532	850	410	410	620	465	339	306	564	212	339
26	406	509	898	410	410	628	447	332	501	651	224	312
27	422	486	934	410	410	628	432	332	772	613	250	300
28	472	465	906	410	410	623	418	328	870	568	254	292
29	502	446	814	410	410	615	407	326	820	547	251	295
30	513	428	756	410	------	605	400	329	805	525	248	307
31	517	------	714	500	------	590	------	327	------	471	200	------
TOTAL	11,144	18,740	19,735	14,057	23,930	18,263	14,903	10,426	10,821	14,108	8,750	8,496
MEAN	359	625	637	453	825	589	497	336	361	455	282	283
MAX	517	721	934	697	1,910	748	571	394	870	840	410	363
MIN	208	428	300	410	410	400	400	300	240	237	200	212
CFSM	.92	1.60	1.63	1.16	2.12	1.51	1.27	.86	.92	1.17	.72	.73
IN.	1.06	1.79	1.88	1.34	2.28	1.74	1.42	.99	1.03	1.35	.83	.81

CAL YR 1967: TOTAL 174,237 MEAN 477 MAX 1,020 MIN 188 CFSM 1.22 IN 16.62
WAT YR 1968: TOTAL 173,373 MEAN 474 MAX 1,910 MIN 200 CFSM 1.21 IN 16.53

4-1027. Black River near Bangor, Mich.

Location.--Lat 42°21'15", long 86°11'15", in NW1/4 sec.28, T.1 S., R.16 W., on left bank 50 ft upstream from bridge on 66th Street, 4.9 miles northwest of Bangor.

Drainage area.--83.6 sq mi.

Records available.--June 1966 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 615 ft (from topographic map).

Extremes.--Maximum discharge during year, 681 cfs Feb. 2 (gage height, 9.92 ft); minimum, 29 cfs Sept. 1 (gage height, 2.13 ft).
1966-68: Maximum discharge, that of Feb. 2, 1968; minimum, 20 cfs Sept. 28, 1966 (gage height, 1.83 ft).

Remarks.--Records good except those for winter periods, which are fair. Occasional regulation caused by mills above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	48	107	62	110	500	65	97	60	43	177	41	32
2	44	154	61	120	658	65	90	58	42	137	40	41
3	40	157	61	110	621	65	85	59	41	107	38	38
4	38	175	60	100	506	67	133	56	40	85	37	32
5	36	170	60	90	402	70	172	50	39	70	36	34
6	35	158	64	90	327	74	156	49	39	62	36	34
7	34	149	75	85	281	82	127	48	38	56	35	32
8	35	142	88	85	251	106	106	47	38	52	35	31
9	42	144	92	80	216	196	88	48	46	49	35	34
10	44	153	93	80	188	272	70	46	40	46	34	39
11	45	160	128	80	200	272	74	44	38	45	33	39
12	46	186	256	80	190	235	74	41	36	43	32	36
13	44	171	308	75	170	184	72	40	36	42	32	34
14	46	156	268	75	150	151	77	42	35	42	32	33
15	46	139	215	70	135	133	91	46	34	40	31	32
16	58	121	172	70	120	133	100	50	34	40	67	31
17	62	110	143	70	110	136	94	53	34	38	72	32
18	58	106	125	75	100	130	96	52	35	35	72	34
19	57	106	119	80	95	127	97	53	39	41	63	37
20	54	101	110	85	90	143	93	54	36	38	52	38
21	50	118	219	90	90	139	88	54	36	36	46	37
22	48	91	382	91	80	130	83	50	40	36	42	36
23	45	88	348	89	75	121	78	48	39	37	39	36
24	44	86	280	86	70	116	74	48	41	73	37	36
25	50	82	236	80	65	150	74	46	54	89	34	36
26	56	78	207	75	65	170	72	44	190	79	33	34
27	62	74	180	85	65	165	68	46	209	66	32	34
28	92	69	150	200	65	144	65	46	211	61	31	32
29	98	66	130	400	65	121	62	48	196	53	31	31
30	101	63	112	500	------	106	61	46	223	47	30	30
31	101	------	108	450	------	98	------	44	------	43	30	------
TOTAL	1,659	3,680	4,912	3,856	5,950	4,166	2,717	1,516	2,002	1,869	1,238	1,035
MEAN	53.5	123	158	124	205	134	90.6	48.9	66.7	60.3	39.9	34.5
MAX	101	186	382	500	658	272	172	60	223	177	72	41
MIN	34	63	60	70	65	65	61	40	34	36	30	30
CFSM	.64	1.47	1.89	1.48	2.45	1.60	1.08	.58	.80	.72	.48	.41
IN.	.74	1.64	2.19	1.72	2.65	1.85	1.21	.67	.89	.83	.55	.46

CAL YR 1967: TOTAL 40,578 MEAN 111 MAX 466 MIN 26 CFSM 1.33 IN. 18.06
WAT YR 1968: TOTAL 34,600 MEAN 94.5 MAX 658 MIN 30 CFSM 1.13 IN. 15.40

PEAK DISCHARGE (BASE, 350 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-22	1600	7.22	391	02-02	1800	9.92	681
01-30	unknown	unknown	about 550				

4-1035. Kalamazoo River at Marshall, Mich.

Location.—Lat 42°15'55", long 84°57'55", on line between secs. 25 and 26, T.2 S., R.6 W., on left bank at upstream side of bridge on U. S. Highway 27 at Marshall.

Drainage area.—449 sq mi.

Records available.—October 1948 to September 1968. Monthly discharge only for October 1948, published in WSP 1307.

Gage.—Digital water-stage recorder. Datum of gage is 877.09 ft above mean sea level, datum of 1929 (levels by Michigan Department of Conservation). Prior to Nov. 11, 1948, wire-weight gage and Nov. 11, 1948 to Nov. 14, 1962, graphic water-stage recorder at same site and datum.

Average discharge.—20 years, 284 cfs.

Extremes.—Maximum discharge during year, 1,260 cfs June 30 (gage height 6.86 ft); minimum, 34 cfs Sept. 4; minimum daily, 140 cfs Oct. 6, 7.

1948-68: Maximum discharge, 2,130 cfs Mar. 29, 1950 (gage height, 8.20 ft); minimum, 12 cfs Aug. 2, 1967; minimum gage height, 3.00 ft May 16, 1963; minimum daily discharge, 31 cfs Aug. 16, 1964.

Remarks.—Records good. Diurnal fluctuation caused by powerplant above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	169	312	223	420	674	246	349	306	642	1,080	434	175
2	175	270	255	370	875	279	453	267	558	945	401	318
3	147	321	223	350	999	229	384	282	492	811	359	264
4	167	349	207	320	1,030	276	478	270	420	664	318	229
5	150	375	306	300	972	303	544	270	391	604	391	232
6	140	321	264	290	875	232	572	270	294	544	318	264
7	140	343	209	280	765	270	562	288	327	506	282	252
8	150	303	276	270	674	270	513	261	291	453	394	199
9	160	303	279	260	597	288	485	229	291	430	362	261
10	160	309	333	260	397	336	414	264	246	417	297	267
11	160	324	397	240	430	288	397	258	270	333	340	282
12	170	297	485	234	411	327	333	243	294	440	297	249
13	175	273	495	240	404	273	391	267	229	365	318	267
14	159	309	499	258	388	294	327	270	258	384	291	252
15	201	267	450	240	330	309	414	276	252	324	243	246
16	232	252	424	226	349	306	384	303	201	359	312	240
17	291	282	420	249	309	349	356	315	267	394	327	223
18	324	285	400	258	273	375	440	318	264	359	324	288
19	294	327	380	273	297	381	356	282	243	333	300	246
20	306	279	350	267	309	384	372	300	229	407	315	424
21	306	309	480	270	276	437	388	333	249	288	264	333
22	282	297	580	276	270	411	346	264	212	397	282	303
23	255	276	640	276	285	391	333	246	223	288	315	333
24	261	249	780	226	297	424	372	270	309	537	258	346
25	270	294	760	237	267	343	264	258	407	562	255	318
26	223	232	680	246	258	481	407	273	807	551	261	368
27	270	261	600	261	291	509	288	378	931	555	226	343
28	297	234	550	349	273	513	306	551	1,080	586	229	300
29	291	267	520	414	270	509	285	628	1,190	562	270	303
30	261	209	480	555	------	492	315	663	1,200	523	193	303
31	261	------	450	600	------	471	------	681	------	481	273	------
TOTAL	6,847	8,729	13,395	9,315	13,845	10,996	11,828	10,084	13,067	15,502	9,449	8,428
MEAN	221	291	432	300	477	355	394	325	436	500	305	281
MAX	324	375	780	600	1,030	513	572	681	1,200	1,080	434	424
MIN	140	209	207	226	258	229	264	229	201	288	193	175
CFSM	.49	.65	.96	.67	1.06	.79	.88	.72	.97	1.11	.68	.63
IN.	.57	.72	1.11	.77	1.15	.91	.98	.84	1.08	1.28	.78	.70

CAL YR 1967 TOTAL 103,203 MEAN 283 MAX 780 MIN 68 CFSM .63 IN 8.55
WTR YR 1968 TOTAL 131,485 MEAN 359 MAX 1,200 MIN 140 CFSM .80 IN 10.89

4-1050. Battle Creek at Battle Creek, Mich.

Location.--Lat 42°19'55", long 85°09'15", in sec.5, T.2 S., R.7 W., on right bank 350 ft upstream from Emmett Street Bridge at Battle Creek and 3 miles upstream from mouth.

Drainage area.--241 sq mi.

Records available.--October 1930 to September 1931, October 1932 to July 1933, January 1934 to September 1968. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Water-stage recorder. Datum of gage is 823.24 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to May 14, 1951, staff gage at same site and datum.

Average discharge.--35 years (1930-31, 1934-68), 186 cfs.

Extremes.--Maximum discharge during year, 1,560 cfs Feb. 4 (gage height, 2.69 ft); minimum, 54 cfs Oct. 8 (gage height, 0.60 ft).

1930-31, 1932-68: Maximum discharge, 3,640 cfs Apr. 7, 1947 (gage height, 4.48 ft, from floodmark); minimum, 22 cfs Aug. 14, 1934; minimum gage height, about -0.5 ft in July 1936 and on Aug. 31, 1939, due to opening of gates at dam forming control.

Remarks.--Records good. Occasional slight regulation prior to November 1943.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	75	142	111	263	865	126	322	172	289	829	190	78
2	72	154	108	247	1,090	122	300	167	278	757	172	81
3	72	162	108	213	1,243	118	278	162	252	667	154	84
4	66	176	108	185	1,450	115	289	158	223	584	142	84
5	63	190	111	176	1,370	126	300	154	194	520	126	84
6	60	203	115	160	1,117	134	322	146	172	454	138	81
7	57	213	122	150	982	134	349	146	150	404	154	78
8	60	213	134	150	802	150	349	142	130	360	176	78
9	69	203	142	140	616	172	332	142	115	327	247	78
10	72	185	162	140	441	190	300	134	104	289	289	84
11	72	176	190	136	410	194	273	130	101	263	284	115
12	72	172	232	130	354	194	242	130	98	228	268	130
13	72	167	289	120	305	154	228	130	94	198	252	134
14	69	167	398	120	270	158	218	130	87	172	232	146
15	75	167	448	120	230	162	232	130	87	154	208	138
16	87	167	480	120	200	167	247	130	87	138	190	126
17	101	162	428	120	190	185	310	138	91	122	176	111
18	108	158	393	120	170	194	338	138	91	115	158	108
19	108	154	344	120	160	203	310	142	91	115	146	111
20	108	150	305	126	154	213	278	138	84	108	138	142
21	104	150	332	130	150	218	252	134	84	101	126	176
22	101	146	382	134	142	218	232	122	91	98	115	203
23	94	146	552	138	134	223	213	122	94	94	108	242
24	87	142	811	134	126	218	203	115	101	154	101	268
25	84	138	766	126	126	218	194	111	134	172	94	273
26	84	134	576	111	122	232	190	108	218	185	91	252
27	98	130	520	111	122	247	180	130	305	213	87	228
28	104	126	474	134	118	278	180	176	460	228	84	213
29	111	115	404	180	126	327	176	208	730	228	81	194
30	118	115	376	268	------	344	172	242	856	218	78	176
31	130	------	322	278	------	344	------	268	------	203	75	------
TOTAL	2,653	4,823	10,243	4,800	13,585	6,078	7,809	4,595	5,891	8,698	4,880	4,296
MEAN	85.6	161	330	155	468	196	260	148	196	281	157	143
MAX	130	213	811	278	1,450	344	349	268	856	829	289	273
MIN	57	115	108	111	118	115	172	108	84	94	75	78
CFSM	.36	.67	1.37	.64	1.94	.81	1.08	.62	.81	1.16	.65	.59
IN.	.41	.74	1.58	.74	2.10	.94	1.21	.71	.91	1.34	.75	.66

CAL YR 1967: TOTAL 73,494 MEAN 201 MAX 910 MIN 50 CFSM .84 IN 11.34
WAT YR 1968: TOTAL 78,351 MEAN 214 MAX 1,450 MIN 57 CFSM .89 IN 12.09

4-1055. Kalamazoo River near Battle Creek, Mich.

Location.--Lat 42°19'26", long 85°11'51", in SW1/4 sec.1, T.2 S., R.8 W., on left bank, 20 ft upstream from bridge on Kendall Street in Battle Creek.

Drainage area.--824 sq mi.

Records available.--July 1937 to September 1968. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Digital water-stage recorder. Altitude of gage is 815 ft (from topographic map). Prior to Oct. 1, 1957, water-stage recorder at site 4.7 miles downstream at different datum. Oct. 1, 1957, to June 15, 1959, staff gage at bridge 1,800 ft upstream at different datum. June 16, 1959, to Oct. 13, 1960, wire-weight gage and Oct. 14, 1960 to Oct. 12, 1967, graphic water-stage recorder, at present site and datum.

Average discharge.--31 years, 616 cfs.

Extremes.--Maximum discharge during year, 3,080 cfs Feb. 4, 5 (gage height, 6.07 ft); maximum gage height, 6.09 ft May 31; minimum discharge, 182 cfs Aug. 31, Sept. 8; minimum gage height, 3.03 ft Oct. 7; minimum daily, 222 cfs Oct. 7.

1937-68: Maximum discharge, 7,290 cfs Apr. 7, 1947 (gage height, 9.13 ft, site and datum then in use); minimum, 50 cfs Sept. 22, 1939, site then in use; minimum daily, 86 cfs Aug. 5, 1964.

Remarks.--Records good except those for period of indefinite stage-discharge relation, which are fair. Diurnal fluctuation, below 1,500 cfs, caused by powerplants above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	304	560	338	832	1,870	513	926	560	1,110	2,250	739	287
2	294	616	373	686	2,520	490	771	540	987	1,980	629	401
3	304	656	332	617	2,760	501	865	500	795	1,750	570	417
4	258	707	361	606	2,980	486	1,060	450	700	1,480	527	385
5	244	734	332	550	2,920	516	1,060	500	660	1,290	478	296
6	268	698	384	522	2,470	512	1,080	450	580	1,130	522	377
7	222	716	384	537	2,150	517	1,090	450	540	1,010	610	350
8	282	648	416	560	1,810	537	1,080	450	450	919	608	273
9	299	672	416	504	1,520	593	1,020	430	400	851	868	371
10	310	656	490	524	1,240	647	908	400	480	781	803	395
11	277	672	624	507	1,100	643	826	420	450	727	768	432
12	288	592	797	487	1,000	655	792	430	420	677	664	498
13	332	600	842	473	921	575	726	430	380	660	651	451
14	334	555	921	483	901	572	723	430	370	616	606	442
15	360	548	949	474	837	606	805	520	350	608	539	431
16	485	532	916	480	784	612	810	580	420	555	538	398
17	540	555	864	486	735	653	883	580	420	561	612	364
18	548	548	824	493	700	703	885	520	380	568	536	431
19	578	562	770	525	658	741	924	600	380	547	510	388
20	570	562	655	516	618	752	847	580	380	482	459	793
21	525	548	1,020	525	600	784	753	450	350	513	477	707
22	497	476	1,090	539	560	823	751	500	400	499	414	652
23	448	511	1,260	556	540	780	713	540	420	506	417	741
24	483	469	1,450	485	550	824	714	470	540	1,260	445	705
25	448	497	1,490	473	539	805	692	400	628	1,150	345	715
26	442	455	1,270	471	518	849	657	400	1,410	1,030	345	699
27	511	410	1,030	502	513	969	620	500	1,650	975	353	595
28	548	384	1,040	655	532	983	600	682	1,760	1,020	291	587
29	518	378	979	864	518	1,020	500	934	2,100	1,020	299	564
30	520	373	860	1,100	------	1,030	560	999	2,320	936	343	496
31	520	------	868	1,280	------	1,010	------	1,090	------	855	264	------
TOTAL	12,557	16,890	24,345	18,312	35,364	21,701	24,641	16,785	22,230	29,206	16,230	14,641
MEAN	405	563	785	591	1,219	700	821	541	741	942	524	488
MAX	578	734	1,490	1,280	2,980	1,030	1,090	1,090	2,320	2,250	868	793
MIN	222	373	332	471	513	486	500	400	350	482	264	273
CFSM	.49	.68	.95	.72	1.48	.85	1.00	.66	.90	1.14	.64	.59
IN.	.57	.76	1.10	.83	1.60	.98	1.11	.76	1.00	1.32	.73	.66

CAL YR 1967 TOTAL 215,888 MEAN 591 MAX 1,720 MIN 196 CFSM .72 IN 9.74
WTR YR 1968 TOTAL 252,902 MEAN 691 MAX 2,980 MIN 222 CFSM .84 IN 11.41

Note.--Indefinite stage-discharge relation April 27 to May 27.

4-1057. Augusta Creek near Augusta, Mich.

Location.--Lat 42°21'12", long 85°21'14", in SW1/4 sec.27, T.1 S., R.9 W., on left bank 15 ft downstream from bridge on EF Road, and 1.3 miles north of Augusta.

Drainage area.--38.9 sq mi.

Records available.--October 1964 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 815 ft (from topographic map). Prior to June 15, 1965, staff gage at same site and datum.

Extremes.--Maximum discharge during year, 125 cfs Feb. 3 (gage height, 2.39 ft); minimum, 17 cfs Feb. 21 (gage height, 0.67 ft), result of freezeup.
1964-68: Maximum discharge, 125 cfs Feb. 3, 1968 (gage height, 2.39 ft); minimum, 12 cfs July 15, 1965; minimum gage height, 0.67 ft Jan. 16, 1966, Mar. 1, 1967, Feb. 21, 1968.

Remarks.--Records good except those for period of no gage-height record, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	35	50	32	37	82	32	50	37	32	74	38	27
2	32	52	33	35	110	34	47	36	34	64	36	32
3	31	50	34	35	108	30	45	36	30	53	35	32
4	29	48	34	32	92	33	59	31	31	49	34	30
5	29	50	34	34	76	34	60	30	29	48	33	30
6	28	48	35	32	64	34	55	29	28	46	37	28
7	27	45	38	30	57	35	52	30	26	37	44	28
8	28	44	40	33	53	36	48	30	28	34	49	28
9	32	43	41	31	47	43	42	31	29	34	57	30
10	35	45	46	31	40	45	41	30	28	34	55	35
11	34	47	52	31	42	44	40	30	28	33	49	37
12	33	47	75	30	40	42	39	30	30	32	43	35
13	33	47	77	31	38	37	38	30	28	29	40	32
14	33	45	70	31	37	40	55	35	29	28	38	30
15	36	45	59	31	37	39	70	36	31	29	34	30
16	45	43	50	30	37	40	66	40	30	29	38	29
17	43	41	47	33	33	41	59	41	30	29	43	29
18	40	40	46	33	35	42	57	38	29	28	42	30
19	40	40	45	34	34	46	55	40	29	32	40	32
20	38	39	43	36	34	48	51	40	28	30	38	35
21	36	39	66	35	32	48	51	38	30	30	36	36
22	35	40	84	34	35	46	48	35	35	35	34	36
23	35	40	80	34	34	46	48	34	33	45	31	36
24	37	39	70	28	34	46	49	34	36	56	30	40
25	40	39	61	30	32	49	47	32	56	50	29	41
26	40	37	52	30	33	56	46	34	94	46	28	39
27	52	36	45	31	35	59	45	39	104	48	28	36
28	45	34	42	41	34	56	41	40	100	48	27	34
29	45	32	38	52	34	54	39	39	85	43	26	32
30	45	33	37	66	------	51	38	36	78	39	26	32
31	45	------	36	62	------	50	------	34	------	38	25	------
TOTAL	1,136	1,278	1,542	1,093	1,399	1,336	1,481	1,075	1,238	1,250	1,143	981
MEAN	36.6	42.6	49.7	35.3	48.2	43.1	49.4	34.7	41.3	40.3	36.9	32.7
MAX	52	52	84	66	110	59	70	41	104	74	57	41
MIN	27	32	32	28	32	30	38	29	26	28	25	27
CFSM	.94	1.10	1.28	.91	1.24	1.11	1.27	.89	1.06	1.04	.95	.84
IN.	1.09	1.22	1.47	1.04	1.34	1.28	1.42	1.03	1.18	1.20	1.09	.94

CAL YR 1967: TOTAL 14,503 MEAN 39.7 MAX 84 MIN 19 CFSM 1.02 IN 13.87
WAT YR 1968: TOTAL 14,952 MEAN 40.9 MAX 110 MIN 25 CFSM 1.05 IN 14.29

Note.--No gage-height record Oct. 14 to Nov. 20.

4-1058. Gull Creek near Galesburg, Mich.

Location.--Lat 42°18'54", long 85°24'04", in NE1/4 sec.7, T.2 S., R.9 W., on right bank 15 ft upstream from bridge on 37th Street and 2 miles northeast of Galesburg.

Drainage area.--38.1 sq mi.

Records available.--October 1964 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 820 ft (from topographic map).

Extremes.--Maximum discharge during year, 85 cfs July 2 (gage height, 3.41 ft); maximum gage height, 4.73 ft Dec. 29 (ice jam); minimum discharge, 2.0 cfs Aug. 14, 16 (gage height, 2.23 ft).
1964-68: Maximum discharge, that of July 2, 1968; maximum gage height, that of Dec. 29, 1967; minimum discharge, 2.0 cfs Aug. 10, 1966, Aug. 14, 16, 1968; minimum gage height, 2.20 ft July 15, Aug. 10, 1966.

Remarks.--Records fair except those for the winter periods, which are poor. Occasional regulation by many dams upstream.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	12	38	29	52	65	30	20	13	15	84	48	9.0
2	11	41	30	50	73	30	20	12	15	84	45	9.0
3	11	44	29	48	64	30	21	12	14	84	38	10
4	10	50	28	48	60	31	25	12	14	79	29	20
5	10	57	28	48	55	35	24	12	14	65	23	35
6	10	59	28	48	51	35	23	11	14	48	20	45
7	10	62	31	48	49	36	21	11	14	35	18	45
8	10	62	31	48	48	38	18	10	14	28	16	45
9	10	62	31	48	47	42	16	10	14	24	16	40
10	10	61	33	48	46	41	15	10	15	20	15	35
11	11	64	36	47	45	40	14	10	15	18	14	30
12	11	62	44	47	45	40	13	11	16	17	13	25
13	11	61	39	46	44	40	12	10	16	16	11	20
14	12	60	37	44	43	40	21	12	15	16	10	18
15	13	57	33	43	42	35	24	13	15	16	9.0	16
16	16	54	29	42	42	35	23	15	15	14	9.8	15
17	16	51	31	40	41	35	22	16	14	13	11	15
18	18	50	33	39	41	30	22	17	14	13	11	15
19	20	47	32	39	40	27	20	17	15	13	10	15
20	24	44	33	39	40	25	18	16	14	13	9.8	15
21	25	42	49	38	38	24	18	16	15	12	12	15
22	26	38	51	37	36	23	16	15	16	11	16	15
23	26	37	54	36	35	22	16	14	16	12	18	15
24	26	35	59	35	31	22	16	14	17	22	16	15
25	28	34	62	33	30	21	16	14	28	18	15	14
26	28	33	60	32	26	21	16	15	46	24	14	13
27	35	32	59	34	24	20	15	17	59	36	13	12
28	35	31	58	42	25	20	14	17	68	44	11	12
29	34	31	56	50	25	20	14	16	75	47	10	11
30	34	30	55	51	------	20	13	15	81	48	9.5	11
31	33	------	55	49	------	20	------	15	------	48	9.0	------
TOTAL	586	1,429	1,263	1,349	1,251	928	546	418	713	1,022	520.1	610.0
MEAN	18.9	47.6	40.7	43.5	43.1	29.9	18.2	13.5	23.8	33.0	16.8	20.3
MAX	35	64	62	52	73	42	25	17	81	84	48	45
MIN	10	30	28	32	24	20	12	10	14	11	9.0	9.0
CFSM	.50	1.25	1.07	1.14	1.13	.79	.48	.35	.62	.87	.44	.53
IN.	.57	1.39	1.23	1.32	1.22	.91	.53	.41	.70	1.00	.51	.60

CAL YR 1967: TOTAL 10,042.3 MEAN 27.5 MAX 64 MIN 6.5 CFSM .72 IN 9.80
WAT YR 1968: TOTAL 10,635.1 MEAN 29.1 MAX 84 MIN 9.0 CFSM .76 IN 10.38

4-1060. Kalamazoo River at Comstock, Mich.

Location.--Lat 42°17'05", long 85°30'50", in NE1/4 sec.19, T.2 S., R.10 W., on left bank at downstream side of bridge on River Street, in Comstock, a quarter of a mile downstream from Comstock Creek.

Drainage area.--1,010 sq mi, approximately.

Records available.--April to August 1931, October 1932 to September 1968. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Digital water-stage recorder. Datum of gage is 759.12 ft above mean sea level, datum of 1929. Prior to October 1936, staff gage, and October 1936 to October 1945, wire-weight gage, and November 1945 to October 1964, graphic water-stage recorder at same site and datum.

Average discharge.--36 years (1932-68), 798 cfs.

Extremes.--Maximum discharge during year, 3,360 cfs Feb. 6 (gage height, 4.95 ft); minimum, 312 cfs Oct. 8 (gage height, 0.79 ft); minimum daily, 334 cfs Oct. 8.
1931, 1932-68: Maximum discharge, 6,910 cfs Apr. 8, 1947 (gage height, 7.94 ft); minimum, 119 cfs May 29, 1958 (gage height, 0.09 ft); minimum daily, 185 cfs Aug. 7, 1934.

Remarks.--Records good except those for periods of indefinite stage-discharge relation and those for periods of no gage-height record, which are fair. Flow regulated by powerplants above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	578	802	528	1,100	1,840	725	1,290	776	1,290	2,410	948	528
2	653	972	500	1,000	2,310	685	1,100	725	1,260	2,450	873	593
3	507	1,020	514	950	2,700	661	1,000	677	1,250	2,380	873	600
4	440	996	500	900	2,960	669	1,250	615	1,090	2,180	734	593
5	452	1,040	500	850	3,200	693	1,480	725	964	1,970	837	528
6	570	1,080	500	800	3,340	685	1,400	653	810	1,600	669	418
7	476	1,060	528	800	3,110	734	1,370	653	742	1,500	751	521
8	334	1,030	535	800	2,780	776	1,350	638	630	1,300	932	556
9	354	988	528	750	2,400	819	1,320	608	570	1,200	1,050	549
10	360	988	645	750	1,810	900	1,080	578	677	1,100	1,180	600
11	542	964	800	750	1,310	972	980	593	630	1,000	1,140	630
12	623	980	1,000	720	1,220	940	996	638	608	1,000	972	615
13	623	964	1,200	720	1,360	900	1,080	630	549	950	873	535
14	563	908	1,300	720	1,320	846	1,170	623	528	950	873	600
15	446	891	1,300	720	1,300	810	1,090	793	507	1,000	810	623
16	514	855	1,250	720	1,150	810	1,060	820	600	850	768	563
17	528	828	1,230	720	1,040	810	1,040	834	600	700	793	488
18	677	819	1,240	720	608	948	1,100	734	549	800	980	521
19	924	837	1,150	720	742	972	1,100	873	542	900	916	549
20	956	846	1,080	750	1,040	1,030	1,120	837	521	750	677	677
21	734	802	1,190	800	802	1,080	1,100	645	507	750	608	924
22	464	776	1,450	850	751	1,080	980	693	570	750	677	882
23	563	751	1,580	785	802	1,080	916	776	600	908	661	768
24	669	693	1,700	759	828	1,070	972	661	785	873	608	850
25	742	677	1,800	701	776	1,080	882	570	891	1,700	578	1,000
26	693	677	1,700	701	751	1,110	908	570	1,660	1,600	563	940
27	685	653	1,600	685	717	1,120	882	742	1,810	1,440	549	802
28	785	563	1,500	751	742	1,260	793	882	2,060	1,340	535	709
29	810	578	1,400	1,080	742	1,280	693	1,170	1,950	1,320	464	677
30	802	578	1,300	1,320	------	1,310	793	1,180	2,230	1,230	452	717
31	785	------	1,200	1,560	------	1,300	------	1,330	------	1,080	429	------
TOTAL	18,852	25,616	33,248	25,952	44,451	29,155	32,295	23,242	27,980	39,981	23,813	19,556
MEAN	608	854	1,073	837	1,533	940	1,077	750	933	1,290	768	652
MAX	956	1,080	1,800	1,560	3,340	1,310	1,480	1,330	2,230	2,450	1,180	1,000
MIN	334	563	500	685	608	661	693	570	507	700	429	418
CFSM	.60	.85	1.06	.83	1.52	.93	1.07	.74	.92	1.28	.76	.65
IN.	.69	.94	1.22	.96	1.64	1.07	1.19	.86	1.03	1.47	.88	.72

CAL YR 1967 TOTAL 304,933 MEAN 835 MAX 2,140 MIN 334 CFSM .83 IN 11.23
WTR YR 1968 TOTAL 344,141 MEAN 940 MAX 3,340 MIN 334 CFSM .93 IN 12.67

4-1063. Portage Creek near Kalamazoo, Mich.

Location.--Lat 42°14'46", long 85°34'33", in SE1/4 sec.34, T.2 S., R.11 W., on left bank 25 ft upstream from bridge on Lovers Lane and 3.0 miles south of Kalamazoo.

Drainage area.--22.4 sq mi.

Records available.--October 1964 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 814.88 ft above mean sea level, datum of 1929.

Extremes.--Maximum discharge during year, 180 cfs June 25 (gage height, 3.60 ft); minimum, 26 cfs Aug. 31 (gage height, 1.49 ft).

1964-68: Maximum discharge, that of June 25, 1968; minimum 8.0 cfs Jan. 19, 1965 (gage height, 0.88 ft, result of bridge construction upstream).

Remarks.--Records good. Flow includes water which is pumped from ground water sources by industry and discharged into stream two miles above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	39	46	36	41	87	37	39	40	31	38	33	31
2	43	47	35	40	94	36	40	40	30	36	34	32
3	42	45	38	40	62	34	43	41	31	34	32	32
4	43	46	36	40	50	36	68	37	30	30	31	32
5	41	42	38	40	48	38	48	34	30	31	36	32
6	39	42	41	40	46	36	44	37	30	31	36	32
7	38	41	42	40	45	38	41	37	32	31	36	29
8	40	40	40	40	44	39	42	36	30	34	39	29
9	43	41	38	40	43	43	41	34	30	38	41	34
10	41	43	42	40	41	40	40	34	31	40	36	38
11	40	47	51	40	40	40	40	34	31	38	32	34
12	38	42	73	40	41	40	41	33	32	36	32	31
13	35	40	50	40	41	40	39	34	30	34	33	32
14	34	40	45	40	41	39	61	40	31	34	32	29
15	38	38	43	40	41	40	62	32	30	38	32	28
16	46	34	41	40	41	40	48	41	29	36	34	32
17	44	40	41	39	40	40	46	34	30	32	38	30
18	41	40	42	41	38	41	47	32	30	33	33	34
19	40	38	41	42	41	42	45	33	30	33	34	38
20	38	36	41	41	39	43	43	32	29	31	36	38
21	36	36	88	40	37	43	41	30	33	29	35	34
22	35	39	62	41	36	41	41	31	33	35	35	37
23	36	38	48	41	37	41	42	31	32	41	34	38
24	38	38	44	40	36	41	41	31	41	114	32	41
25	42	38	44	38	35	45	42	29	90	52	29	37
26	39	36	43	39	36	48	42	31	95	41	31	35
27	54	38	43	41	38	46	41	36	65	46	30	34
28	44	38	43	49	38	44	38	34	49	41	30	32
29	36	38	43	58	35	44	41	34	44	38	29	31
30	38	38	42	59	------	41	40	32	40	35	31	33
31	36	------	42	49	------	40	------	31	------	36	28	------
TOTAL	1,237	1,205	1,396	1,299	1,291	1,256	1,327	1,065	1,129	1,196	1,034	999
MEAN	39.9	40.2	45.0	41.9	44.5	40.5	44.2	34.4	37.6	38.6	33.4	33.3
MAX	54	47	88	59	94	48	68	41	95	114	41	41
MIN	34	34	35	38	35	34	38	29	29	29	28	28

CAL YR 1967: TOTAL 15,738 MEAN 43.1 MAX 88 MIN 29
WTR YR 1968: TOTAL 14,434 MEAN 39.4 MAX 114 MIN 28

PEAK DISCHARGE (BASE, 85 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-12	0200	2.81	95	04-14	1900	2.89	100
12-21	0900	3.00	115	06-25	1700	3.60	180
02-01	1500	3.00	115	07-24	0700	3.40	156

4-1064. West Fork Portage Creek at Kalamazoo, Mich.

Location.--Lat 42°14'40", long 85°36'50", in NE1/4 sec.5, T.3 S., R.11 W., on right bank 30 ft upstream from culvert on Oakland Drive, 2 1/2 miles upstream from mouth, and 3.7 miles southwest of main business district of Kalamazoo.

Drainage area.--18.7 sq mi.

Records available.--September 1959 to September 1968.

Gage.--Water-stage recorder and V-notch sharp-crested weir. Datum of gage is 858.09 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources).

Average discharge.--9 years, 8.29 cfs.

Extremes.--Maximum discharge during year, 25 cfs June 27 (gage height, 2.51 ft); minimum, 3.4 cfs June 20 (gage height, 1.81 ft).
1959-68: Maximum discharge, 39 cfs Dec. 8, 1966; maximum gage height, 3.12 ft Mar. 20, 1963; minimum discharge, 1.0 cfs Aug. 9, 1964; minimum gage height, 0.88 ft July 30, 1963, caused by construction.

Remarks.--Records good.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	13	16	11	11	20	10	11	10	12	16	10	7.6
2	13	16	11	11	24	10	11	10	11	14	9.7	9.1
3	12	16	12	11	22	10	11	10	10	12	9.1	9.1
4	12	16	12	10	19	10	14	9.4	10	11	8.9	9.1
5	12	17	12	10	17	10	13	10	9.4	10	8.6	9.1
6	11	16	12	10	16	10	13	10	9.1	9.7	8.6	9.1
7	10	16	12	10	14	11	13	9.7	8.9	9.4	8.6	8.9
8	11	15	13	10	13	11	12	9.7	8.3	9.1	8.3	8.6
9	11	14	13	10	13	13	12	10	7.9	9.7	8.6	8.9
10	11	14	13	10	12	15	12	10	7.6	9.4	8.3	9.7
11	11	15	15	10	11	14	11	10	8.3	9.1	7.9	9.7
12	11	15	20	10	11	13	11	10	8.6	8.9	7.6	9.7
13	11	15	20	10	11	13	10	10	8.3	8.9	7.0	9.4
14	11	14	18	10	11	13	12	10	7.6	8.9	7.6	9.4
15	12	14	16	10	11	12	15	10	7.9	8.6	7.6	9.1
16	14	13	15	10	11	12	14	12	7.9	8.3	7.9	8.9
17	14	13	15	11	11	12	13	12	7.9	7.6	9.1	8.9
18	14	13	14	11	11	12	12	12	8.3	7.6	9.1	9.4
19	14	13	13	11	11	12	12	12	7.1	8.3	9.1	10
20	14	13	13	11	11	12	11	12	5.6	7.6	8.9	10
21	13	13	18	10	11	12	11	12	11	7.0	8.6	10
22	12	12	18	10	11	12	10	12	9.7	7.9	8.6	11
23	12	12	18	10	11	12	10	11	9.1	8.6	7.9	12
24	11	12	16	9.0	11	13	10	11	10	16	7.6	12
25	12	12	16	9.0	10	13	10	11	14	19	7.0	12
26	12	12	15	10	10	13	10	11	22	19	6.5	11
27	15	12	14	11	10	13	10	12	24	18	6.5	11
28	16	12	13	12	10	12	10	12	24	16	6.1	11
29	16	11	12	14	10	12	10	12	21	14	6.1	11
30	16	11	12	17	------	11	10	12	18	12	6.5	10
31	16	------	12	16	------	11	------	12	------	11	6.5	------
TOTAL	393	413	444	335.0	374	369	344	336.8	334.5	342.6	248.4	294.7
MEAN	12.7	13.8	14.3	10.8	12.9	11.9	11.5	10.9	11.2	11.1	8.01	9.82
MAX	16	17	20	17	24	15	15	12	24	19	10	12
MIN	10	11	11	9.0	10	10	10	9.4	5.6	7.0	6.1	7.6
CFSM	.68	.74	.77	.58	.69	.64	.61	.58	.60	.59	.43	.53
IN.	.78	.82	.88	.67	.74	.73	.68	.67	.67	.68	.49	.59

CAL YR 1967: TOTAL 4,088.6 MEAN 11.2 MAX 22 MIN 6.7 CFSM .60 IN 8.12
WAT YR 1968: TOTAL 4,229.0 MEAN 11.6 MAX 24 MIN 5.6 CFSM .62 IN 8.41

4-1085. Kalamazoo River near Fennville, Mich.

Location.--Lat 42°35'36", long 85°59'03", in NE¼ sec.5, T.2 N., R.14 W., on left bank 40 ft upstream from bridge on State Highway 89, 2.1 miles downstream from Swan Creek, 4.0 miles downstream from Calkins Dam, and 6.1 miles east of Fennville.

Drainage area.--1,600 sq mi, approximately.

Records available.--April 1929 to September 1936, October 1937 to September 1968. Monthly discharge only for some periods, published in WSP 1307. Published as "near Allegan" April 1929 to September 1932; as "at Calkins Bridge, near Allegan" October 1932 to September 1936, October 1937 to September 1938; as "at Calkins Dam, near Allegan" October 1938 to September 1950.

Gage.--Digital water-stage recorder. Datum of gage is 586.51 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). April 1929 to September 1936 at bridge and October 1937 to September 1950 in powerplant, 4.0 miles upstream at mean sea level datum (levels by city of Allegan). September 1950 to Nov. 21, 1962 graphic water-stage recorder at present site and datum.

Average discharge.--38 years, 1,309 cfs.

Extremes.--Maximum discharge during year, 4,980 cfs Feb. 2 (gage height, 12.70 ft); minimum daily, 525 cfs July 16.
1929-36, 1937-68: Maximum discharge, 17,500 cfs Apr. 11, 1947 (gage height, 606.76 ft, site and datum then in use); minimum daily, 73 cfs Aug. 31, 1941.

Remarks.--Records excellent. Flow regulated at low and medium stages by powerplants above station and since June 1936, by Calkins Dam and powerplant 4.0 miles above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	991	1,560	1,400	1,850	3,530	1,360	2,050	1,310	1,550	2,840	1,680	670
2	877	1,650	1,350	1,830	4,740	1,320	1,830	1,280	1,590	2,850	1,450	928
3	847	1,810	1,280	1,660	3,560	1,320	1,570	1,290	2,130	2,960	1,260	970
4	838	2,380	1,320	1,650	4,140	1,300	1,870	1,380	2,150	2,910	1,290	1,060
5	853	2,380	1,270	1,820	4,370	1,260	2,350	1,200	1,540	2,830	1,240	1,060
6	883	2,350	1,220	1,670	4,340	1,260	2,390	1,180	1,320	2,810	1,310	1,050
7	808	1,930	1,190	1,690	3,890	1,290	2,000	995	1,430	2,750	1,090	769
8	769	1,770	1,260	1,740	3,780	1,370	1,950	1,090	1,260	2,250	1,130	667
9	946	1,720	1,320	1,620	3,800	1,360	1,940	1,100	1,230	1,850	1,350	1,010
10	940	1,850	1,280	1,460	3,630	1,390	1,940	1,140	1,170	1,760	1,340	829
11	946	1,870	1,440	1,500	3,260	1,520	1,880	1,140	964	1,620	1,560	1,190
12	877	1,870	1,680	1,500	2,190	1,630	1,780	1,020	862	1,690	1,600	1,130
13	820	1,930	2,240	1,490	2,040	1,610	1,870	1,040	1,020	1,460	1,330	1,110
14	829	1,940	2,340	1,430	1,910	1,590	1,700	1,080	1,020	1,350	1,320	1,010
15	1,100	1,930	2,470	1,460	2,490	1,580	1,540	1,050	766	628	1,040	1,050
16	1,280	1,900	2,470	1,540	2,510	1,660	1,690	1,160	907	525	1,080	1,090
17	1,030	1,880	2,500	1,440	2,360	1,500	1,820	1,220	1,050	1,320	1,600	961
18	1,080	1,800	2,470	1,380	1,800	1,460	1,830	1,270	1,090	1,720	1,150	1,140
19	1,090	1,790	2,410	1,420	1,580	1,530	1,800	1,170	991	1,230	1,330	1,110
20	1,190	1,810	2,240	1,310	1,390	1,610	1,870	1,230	958	1,170	1,780	844
21	1,130	1,820	2,040	1,370	1,450	1,790	1,720	1,240	1,060	1,160	673	970
22	1,210	1,760	2,080	1,480	1,560	1,890	1,730	1,220	916	998	1,280	1,060
23	1,320	1,430	2,320	1,400	1,530	1,790	1,740	1,240	977	1,080	1,150	1,140
24	1,250	1,340	2,840	1,450	1,500	1,730	1,760	1,190	1,220	1,690	1,070	1,160
25	1,260	1,280	3,200	1,400	1,360	1,780	1,710	1,260	1,430	1,940	1,050	1,280
26	1,200	1,310	3,090	1,320	1,460	1,930	1,630	1,150	1,960	1,970	1,040	1,280
27	1,180	1,430	2,960	1,240	1,420	2,240	1,610	1,210	2,190	1,820	814	1,280
28	1,260	1,460	2,660	1,360	1,410	2,120	1,450	1,160	2,790	1,830	931	1,280
29	1,340	1,430	2,030	1,690	1,420	2,050	1,340	1,130	2,730	2,010	934	1,280
30	1,470	1,400	2,460	1,880	------	2,120	1,320	1,210	2,640	1,790	862	1,280
31	1,520	------	2,100	2,000	------	2,010	------	1,420	------	1,660	871	------
TOTAL	33,134	52,790	62,930	48,050	74,420	50,370	53,680	36,775	42,911	56,471	37,605	31,658
MEAN	1,069	1,760	2,030	1,550	2,566	1,625	1,789	1,186	1,430	1,822	1,213	1,055
MAX	1,520	2,380	3,200	2,000	4,740	2,240	2,390	1,420	2,790	2,960	1,780	1,280
MIN	769	1,280	1,190	1,240	1,360	1,260	1,320	995	766	525	673	667
CFSM	.67	1.10	1.27	.97	1.60	1.02	1.12	.74	.89	1.14	.76	.66
IN.	.77	1.23	1.46	1.12	1.73	1.17	1.25	.85	1.00	1.31	.87	.74

CAL YR 1967 TOTAL 568,939 MEAN 1,559 MAX 3,820 MIN 517 CFSM .97 IN 13.22
WTR YR 1968 TOTAL 580,794 MEAN 1,587 MAX 4,740 MIN 525 CFSM .99 IN 13.50

4-1086. Rabbit River near Hopkins, Mich.

Location.--Lat 42°38'32", long 85°43'19", in SE1/4 sec.16, T.3 N., R.12 W., on left bank, at downstream side of bridge on 18th Street, 2.5 miles northeast of Hopkins.

Drainage area.--71.4 sq mi.

Records available.--October 1965 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 700 ft (from topographic map).

Extremes.--Maximum discharge during year, 550 cfs Feb. 1 (gage height, 7.76 ft); minimum, 12 cfs July 23, Aug. 30, 31, Sept. 1, Sept. 7-9, 15-18; minimum gage height, 2.12 ft Aug. 31, Sept. 1.
1966-68: Maximum discharge, that of Feb. 1, 1968; maximum gage height, 7.84 ft Feb. 10, 1966; minimum discharge, 9.8 cfs Aug. 7, 8, Sept. 20, 26, 27, 1966; minimum gage height, 1.93 ft Sept. 20, 26, 27, 1966.

Remarks.--Records good except those for winter periods, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	24	67	32	50	370	35	64	34	32	54	17	12
2	22	97	33	50	472	35	57	32	34	40	16	16
3	21	86	32	50	346	35	52	32	31	33	15	15
4	19	93	33	48	265	36	90	33	27	29	15	13
5	19	90	34	47	176	38	81	33	25	28	16	13
6	18	88	38	46	132	40	63	32	24	27	21	14
7	18	82	56	45	125	45	56	31	23	24	19	12
8	19	75	68	45	107	48	50	30	22	22	21	12
9	23	75	61	43	91	54	47	30	22	21	30	12
10	28	76	55	40	95	56	44	28	22	20	28	16
11	28	96	82	40	85	52	43	28	22	19	21	17
12	25	148	219	40	75	49	42	27	21	18	19	16
13	25	123	234	38	70	47	40	26	21	17	18	14
14	27	94	154	38	64	46	41	29	20	16	17	13
15	28	75	94	38	60	46	53	36	21	15	16	13
16	42	65	69	38	55	46	48	35	20	14	17	12
17	50	58	62	38	50	48	44	39	20	14	24	12
18	43	60	63	38	50	49	49	34	20	14	24	12
19	39	65	64	40	48	55	48	34	21	16	22	14
20	34	56	61	43	46	66	45	35	20	16	22	16
21	32	50	132	46	45	62	47	33	20	14	19	15
22	31	48	181	48	42	59	45	31	23	13	18	14
23	30	49	107	47	38	52	44	29	22	14	17	15
24	29	47	79	45	36	56	47	29	21	35	16	15
25	34	44	72	42	35	74	48	26	24	38	15	16
26	38	42	67	40	35	102	45	26	48	26	14	15
27	40	39	65	45	35	97	41	33	54	22	14	14
28	54	36	60	127	35	76	37	42	52	21	13	14
29	63	35	57	264	35	66	36	44	48	19	13	13
30	68	34	55	378	------	59	35	40	70	18	12	13
31	70	------	52	309	------	59	------	34	------	17	12	------
TOTAL	1,041	2,093	2,471	2,246	3,118	1,688	1,482	1,005	850	694	561	418
MEAN	33.6	69.8	79.7	72.5	108	54.5	49.4	32.4	28.3	22.4	18.1	13.9
MAX	70	148	234	378	472	102	90	44	70	54	30	17
MIN	18	34	32	38	35	35	35	26	20	13	12	12
CFSM	.47	.98	1.12	1.01	1.51	.76	.69	.45	.40	.31	.25	.20
IN.	.54	1.09	1.29	1.17	1.62	.88	.77	.52	.44	.36	.29	.22

CAL YR 1967: TOTAL 21,273 MEAN 58.3 MAX 295 MIN 13 CFSM .82 IN 11.08
WAT YR 1968: TOTAL 17,667 MEAN 48.3 MAX 472 MIN 12 CFSM .68 IN 9.20

PEAK DISCHARGE (BASE, 350 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
01-30	0600	7.48	405	02-01	1700	7.76	550

4-1088. Black River near Zeeland, Mich.

Location.--Lat 42°46'40", long 86°01'06", in NW1/4 sec.31, T.5 N., R.14 W., on left bank 20 ft upstream from bridge on State Road, 0.2 mile downstream from South Branch, and 2 1/2 miles south of Zeeland.

Drainage area.--65.8 sq mi.

Records available.--October 1960 to September 1968.

Gage.--Digital water-stage recorder. Altitude of gage is 595 ft (from topographic map). Prior to Sept. 29, 1966, graphic water-stage recorder at same site and datum.

Average discharge.--8 years, 51.0 cfs.

Extremes.--Maximum discharge during year, 1,370 cfs Feb. 1 (gage height, 11.15 ft); maximum gage height, 11.91 ft Jan. 30 (backwater from ice); minimum discharge, 1.6 cfs Aug. 26 (gage height, 2.21 ft).
1960-68: Maximum discharge, 2,760 cfs Feb. 10, 1966; minimum, 0.9 cfs Aug. 24, 1962; minimum gage height, 2.21 ft Aug. 26, 1968.

Remarks.--Records good except those for winter periods, which are poor.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.4	169	18	29	828	12	22	11	9	48	3.9	2.7
2	4.4	490	17	28	1,100	12	19	10	12	22	3.6	3.0
3	4.1	305	18	27	494	13	19	10	10	14	3.5	2.7
4	3.8	308	17	27	255	14	232	10	8	10	3.5	2.5
5	3.9	212	17	26	117	16	114	9.7	6.7	13	4.6	3.0
6	3.8	183	22	25	78	30	45	8.9	6.4	9.3	6.2	2.8
7	3.9	146	66	25	70	45	34	8.4	6.2	7.1	4.9	2.8
8	4.6	137	117	24	60	65	27	8.0	5.9	6.2	5.1	2.5
9	7.1	225	66	23	50	100	22	8.0	5.4	6.2	9.3	3.1
10	9.3	161	52	22	40	141	18	7.6	5.4	6.2	11	3.8
11	10	296	212	21	33	90	16	7.6	5.1	5.4	9.3	3.8
12	8.9	377	611	21	28	69	14	7.6	4.9	4.9	7.1	3.0
13	9.7	185	611	21	25	44	13	6.7	4.6	4.4	4.9	2.7
14	9.7	108	220	21	23	34	14	12	4.6	6.4	3.9	2.7
15	11	88	80	21	22	27	16	12	4.6	4.9	3.6	2.5
16	78	55	46	21	20	34	14	10	4.4	4.1	3.9	2.5
17	99	47	39	21	19	39	13	9.3	4.1	3.8	5.1	2.7
18	43	60	46	21	18	40	16	7.6	4.9	3.8	3.8	3.0
19	47	68	58	22	17	81	17	9.3	5.7	4.1	4.9	3.3
20	34	45	48	24	16	148	16	8.9	5.1	3.9	5.4	3.6
21	20	37	280	26	15	62	24	7.1	5.9	3.6	3.5	3.6
22	16	35	425	27	14	45	20	6.4	6.4	3.5	3.0	3.8
23	13	42	137	27	14	34	17	6.4	5.1	4.1	2.8	3.6
24	12	38	64	26	14	40	18	5.9	5.7	61	2.5	5.1
25	30	32	55	24	13	121	20	5.4	7.1	31	2.4	7.1
26	40	30	47	24	12	144	18	6.2	26	13	2.4	4.9
27	34	26	40	26	12	77	15	8.4	54	7.6	2.5	3.9
28	142	22	37	100	12	47	12	9.3	48	5.9	2.5	3.6
29	133	20	33	400	12	34	12	16	65	4.9	2.5	3.6
30	92	18	31	900	------	26	12	12	142	4.4	2.4	3.5
31	126	------	30	733	------	23	------	10	------	4.1	2.3	------
TOTAL	1,058.6	3,965	3,560	2,783	3,431	1,707	869	275.7	488.2	330.8	136.3	101.4
MEAN	34.1	132	115	89.8	118	55.1	29.0	8.89	16.3	10.7	4.40	3.38
MAX	142	490	611	900	1,100	148	232	16	142	61	11	7.1
MIN	3.8	18	17	21	12	12	12	5.4	4.1	3.5	2.3	2.5
CFSM	.52	2.01	1.75	1.36	1.79	.84	.44	.14	.25	.16	.07	.05
IN.	.60	2.24	2.01	1.57	1.94	.96	.49	.16	.28	.19	.08	.06

CAL YR	1967:	TOTAL	28,368.5	MEAN	77.7	MAX	1,270	MIN	1.7	CFSM	1.18	IN.	16.03
WTR YR	1968:	TOTAL	18,706.0	MEAN	51.1	MAX	1,100	MIN	2.3	CFSM	.78	IN.	10.57

PEAK DISCHARGE (BASE, 600 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-12	2200	10.59	896	01-30	--	--	1,200
02-01	2200	11.15	1,370				

GPO 817-436-8

4-1090. Grand River at Jackson, Mich.

Location.--Lat 42°17'05", long 84°24'30", in sec.22, T.2 S., R.1 W., on left bank at sewage-treatment plant, 1 mile north of Jackson, 2 1/4 miles upstream from Portage River, and at mile 216.

Drainage area.--174 sq mi.

Records available.--April 1935 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 900.00 ft above mean sea level (Fargo Engineering Co. bench mark). Prior to Sept. 24, 1935, staff gage and Sept. 24, 1935, to Oct. 22, 1965, graphic water-stage recorder at same site and datum.

Average discharge.--33 years, 112 cfs.

Extremes.--Maximum discharge during year, 1,050 cfs June 25 (gage height, 15.44 ft); minimum, 16 cfs Oct. 1, Mar. 3 (gage height, 8.28 ft); minimum daily discharge, 19 cfs Oct. 1.
1935-68: Maximum discharge, 1,070 cfs June 25, 1937 (gage height, 13.50 ft); maximum gage height, 15.44 ft June 25, 1968; minimum discharge, 9.2 cfs Aug. 22, 1936.

Remarks.--Records good except those for the winter period, which are fair. Slight regulation by mills above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	19	124	71	72	326	127	160	109	425	705	196	60
2	28	107	78	71	416	76	162	89	428	705	187	60
3	30	162	73	68	441	52	172	127	428	677	235	60
4	31	198	77	66	452	72	273	130	390	635	264	70
5	31	219	80	61	472	130	334	119	337	638	246	100
6	30	223	89	57	438	135	355	124	302	598	219	90
7	24	153	148	64	401	136	348	85	235	545	225	80
8	41	109	167	67	400	141	342	73	189	490	322	70
9	34	104	153	69	398	156	297	69	176	435	257	90
10	33	104	216	76	356	153	244	66	150	395	262	130
11	30	107	212	81	300	162	234	66	115	364	241	200
12	31	95	216	76	270	119	226	57	106	334	181	225
13	34	98	207	72	230	98	214	68	94	264	143	151
14	27	101	208	73	200	103	210	89	88	187	130	88
15	94	95	174	70	170	107	205	131	80	181	121	68
16	80	138	183	70	140	119	205	198	80	199	133	73
17	113	163	207	70	100	113	205	176	80	210	127	75
18	124	155	216	70	85	128	201	131	80	210	139	121
19	143	143	216	70	85	234	194	95	80	176	189	141
20	144	148	212	80	80	285	189	91	85	131	185	143
21	136	150	228	90	78	261	178	91	89	113	146	113
22	85	150	208	92	75	210	178	119	81	118	141	89
23	87	88	190	136	75	201	144	143	112	183	122	87
24	97	75	150	143	73	207	116	143	107	350	100	131
25	103	73	183	87	66	219	112	133	521	290	85	155
26	94	75	181	82	80	283	81	210	648	295	89	130
27	133	81	165	85	110	305	95	326	637	312	87	110
28	97	80	146	133	120	232	85	367	651	280	85	100
29	88	76	100	148	120	167	97	405	696	278	70	90
30	92	77	66	171	------	158	138	407	711	275	75	90
31	92	------	75	167	------	155	------	417	------	244	70	------
TOTAL	2,225	3,671	4,895	2,737	6,557	5,044	5,994	4,854	8,201	10,817	5,072	3,190
MEAN	71.8	122	158	88.3	226	163	200	157	273	349	164	106
MAX	144	223	228	171	472	305	355	417	711	705	322	225
MIN	19	73	66	57	66	52	81	57	80	113	70	60
CFSM	.41	.70	.91	.51	1.30	.94	1.15	.90	1.57	2.01	.94	.61
IN.	.48	.78	1.05	.58	1.40	1.08	1.28	1.04	1.75	2.31	1.08	.68

CAL YR 1967	TOTAL 39,845	MEAN 109	MAX 324	MIN 19	CFSM .63	IN 8.52
WTR YR 1968	TOTAL 63,257	MEAN 173	MAX 711	MIN 19	CFSM .99	IN 13.52

4-1110. Grand River near Eaton Rapids, Mich.

Location.--Lat 42°32'05", long 84°37'25", in NE1/4 sec.26, T.2 N., R.3 W., on right bank 400 ft upstream from bridge on Petrieville Highway, 2 miles northeast of Eaton Rapids, 2 1/2 miles downstream from Spring Brook, 25 miles upstream from Cedar River, and at mile 178.

Drainage area.--661 sq mi.

Records available.--October 1950 to September 1968. Gage-height records for flood seasons collected in this vicinity 1905-28 are contained in reports of U. S. Weather Bureau.

Gage.--Digital water-stage recorder. Datum of gage is 852.68 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Nov. 14, 1962, graphic water-stage recorder at same site and datum.

Average discharge.--18 years, 408 cfs.

Extremes.--Maximum discharge during year, 3,220 cfs June 28 (gage height, 8.19 ft); minimum, 28 cfs Oct. 8 (gage height, 0.87 ft); minimum daily discharge, 87 cfs Oct. 8.

1950-68: Maximum discharge, 3,360 cfs May 1, 1956; maximum gage height, 8.19 ft June 28, 1968; minimum discharge, 14 cfs Dec. 20, 1962, Oct. 14, 1966; minimum gage height, 0.67 ft Dec. 20, 1962; minimum daily, 21 cfs Oct. 12, 1964.

Flood of Apr. 4, 1950 reached a stage of 8.15 ft (discharge, 3,860 cfs).

Remarks.--Records good except those for the winter period, which are fair. Diurnal fluctuation caused by power-plant at Smithville and mills at Eaton Rapids. Records of water temperature for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	121	322	257	540	1,490	280	870	413	1,350	2,690	902	216
2	117	402	266	400	2,220	280	817	392	1,210	2,480	855	229
3	124	442	256	450	2,420	280	778	419	1,120	2,280	780	239
4	121	451	250	450	2,600	280	846	357	1,040	2,100	713	279
5	118	463	307	400	2,310	280	911	363	980	1,960	676	392
6	117	498	260	400	2,020	285	974	438	930	1,900	654	356
7	122	493	297	400	1,810	320	1,030	353	871	1,810	675	324
8	87	452	342	350	1,580	364	1,010	354	813	1,710	618	266
9	119	488	372	350	1,370	409	973	356	764	1,610	800	233
10	125	444	440	300	1,070	465	920	352	718	1,510	793	245
11	129	438	585	300	850	586	871	312	677	1,370	840	295
12	143	428	739	280	750	485	812	268	664	1,230	862	343
13	148	444	810	250	800	495	761	293	645	1,150	803	381
14	143	416	821	280	800	450	730	317	628	1,040	731	387
15	100	403	799	230	800	415	739	294	558	969	675	368
16	161	382	770	250	700	471	734	347	537	888	612	305
17	256	371	730	280	580	529	731	373	513	802	487	256
18	284	383	704	280	500	561	727	352	478	726	527	245
19	299	403	677	260	500	598	715	474	324	681	475	258
20	323	415	630	300	450	636	697	401	331	654	498	319
21	299	412	792	300	400	642	679	365	335	636	460	162
22	292	408	1,010	320	320	687	630	349	356	552	404	253
23	305	405	988	320	270	728	633	344	374	488	489	372
24	277	401	989	320	236	731	619	341	638	508	378	374
25	279	384	981	310	189	744	600	292	745	632	391	396
26	223	344	840	297	226	828	592	404	1,860	762	344	467
27	252	346	775	342	280	911	518	688	2,550	974	344	412
28	333	289	720	593	270	1,000	507	817	3,150	1,050	330	414
29	345	307	680	916	270	1,050	472	1,130	3,140	1,070	268	357
30	345	250	640	1,190	------	1,020	467	1,460	2,940	1,050	291	363
31	330	------	620	1,070	------	938	------	1,490	------	977	267	------
TOTAL	6,437	12,084	19,347	12,728	28,081	17,748	22,363	14,908	31,239	38,259	17,942	9,506
MEAN	208	403	624	411	968	573	745	481	1,041	1,234	579	317
MAX	345	498	1,010	1,190	2,600	1,050	1,030	1,490	3,150	2,690	902	467
MIN	87	250	250	230	189	280	467	268	324	488	267	162
CFSM	.31	.61	.94	.62	1.46	.87	1.13	.73	1.58	1.87	.88	.48
IN.	.36	.68	1.09	.72	1.58	1.00	1.26	.84	1.76	2.15	1.01	.53

CAL YR 1967 TOTAL 149,714 MEAN 410 MAX 1,630 MIN 35 CFSM .62 IN 8.42
WTR YR 1968 TOTAL 230,642 MEAN 630 MAX 3,150 MIN 87 CFSM .95 IN 12.98

4-1115. Deer Creek near Dansville, Mich.

Location.--Lat 42°36'30", long 84"19'15", in E1/2 sec.33, T.3 N., R.1 E., on right bank 15 ft upstream from bridge on Clark Road, 3 1/2 miles north of Dansville, and 7 1/4 miles upstream from mouth.

Drainage area.--16.3 sq mi.

Records available.--May 1954 to September 1968.

Gage.--Digital water-stage recorder and concrete control. Datum of gage is 889.08 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to May 13, 1968, graphic water-stage recorder at same site and datum.

Average discharge.--14 years, 9.10 cfs.

Extremes.--Maximum discharge during year, 460 cfs June 26 (gage height, 8.77 ft); minimum, 0.46 cfs Oct. 7 (gage height, 2.72 ft).
1954-68: Maximum discharge, 570 cfs May 13, 1956 (gage height, 8.83 ft); minimum, 0.09 cfs Aug. 10, 1964.

Remarks.--Records good except those for the winter period, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.95	3.8	4.0	6.5	186	2.5	16	5.4	15	50	2.3	1.3
2	.85	9.4	4.3	6.0	266	2.5	13	4.8	12	29	2.2	1.5
3	.66	8.8	4.3	5.5	105	2.5	12	4.5	8.8	22	1.8	1.4
4	.58	14	4.3	5.5	60	2.5	44	4.5	6.9	17	1.7	1.3
5	.52	11	4.5	5.0	41	2.8	30	4.8	5.7	16	2.5	1.3
6	.52	8.8	5.7	4.5	32	3.0	21	4.3	4.8	24	5.0	1.2
7	.52	7.2	8.3	4.3	23	3.1	16	3.8	4.0	15	3.5	1.1
8	.66	6.3	9.9	4.3	21	3.5	14	3.8	3.5	11	4.0	1.1
9	1.3	5.7	9.9	4.0	15	4.3	11	3.8	3.1	8.8	17	1.1
10	1.3	5.4	15	4.0	12	4.5	9.4	3.3	2.9	7.9	13	2.0
11	1.2	6.9	65	4.0	9.9	4.3	8.3	3.3	3.1	6.6	8.0	8.0
12	1.2	11	88	4.0	7.5	3.3	7.5	3.5	3.1	5.7	5.0	7.0
13	1.2	9.4	47	4.0	7.5	3.5	7.2	3.5	2.7	4.8	4.7	5.5
14	1.5	8.8	29	4.0	7.0	3.5	14	4.5	2.3	4.8	4.5	3.0
15	1.8	7.9	20	3.8	6.4	5.1	32	4.8	3.1	3.8	4.0	2.0
16	3.1	6.6	16	4.0	5.5	9.9	19	5.1	2.7	3.5	3.5	1.4
17	4.3	6.6	13	4.0	4.5	11	14	5.1	3.5	3.1	3.5	1.1
18	5.1	9.4	13	4.0	4.5	10	12	4.3	2.9	2.7	3.0	1.2
19	3.5	9.9	13	4.5	3.8	11	11	4.5	2.7	2.5	2.5	1.4
20	2.7	7.9	12	5.0	3.5	14	9.9	4.5	2.2	2.2	2.7	3.5
21	2.3	7.5	124	6.0	3.1	14	9.4	3.8	5.1	2.0	2.3	4.0
22	2.0	7.2	120	7.0	3.0	13	7.9	3.3	34	1.7	2.2	3.5
23	1.7	7.2	53	7.0	3.0	6.6	7.9	3.3	23	1.5	1.8	2.7
24	1.7	6.6	32	6.0	2.8	12	7.2	3.1	60	5.4	2.0	3.1
25	1.7	6.3	24	4.5	2.6	22	7.9	2.5	138	4.3	2.0	5.4
26	1.5	5.7	18	4.0	2.5	92	7.9	5.1	395	2.7	1.8	4.0
27	2.7	5.4	14	4.3	2.5	60	7.2	47	236	2.9	1.7	3.1
28	6.6	4.5	12	89	2.5	41	6.3	82	114	5.4	1.5	2.5
29	5.1	4.5	9.4	105	2.5	30	6.0	46	93	3.3	1.4	2.3
30	4.0	4.5	8.3	97	------	23	6.0	29	107	2.5	1.4	2.7
31	3.5	------	6.9	47	------	19	------	20	------	2.3	1.4	------
TOTAL	66.26	224.2	807.8	467.7	845.6	439.4	395.0	331.2	1,300.1	274.4	114.3	80.7
MEAN	2.14	7.47	26.1	15.1	29.2	14.2	13.2	10.7	43.3	8.85	3.69	2.69
MAX	6.6	14	124	105	266	92	44	82	395	50	17	8.0
MIN	.52	3.8	4.0	3.8	2.5	2.5	6.0	2.5	2.2	1.5	1.4	1.1
CFSM	.13	.46	1.60	.93	1.79	.87	.81	.66	2.66	.54	.23	.17
IN.	.15	.51	1.84	1.07	1.93	1.00	.90	.76	2.97	.63	.26	.18

CAL YR 1967 TOTAL 4,031.18 MEAN 11.0 MAX 124 MIN .22 CFSM .68 IN 9.20
WTR YR 1968 TOTAL 5,346.66 MEAN 14.6 MAX 395 MIN .52 CFSM .90 IN 12.20

PEAK DISCHARGE (BASE, 100 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-12	0500	4.16	104	02-02	0830	6.80	314
12-21	2000	5.69	210	03-26	1130	4.20	106
01-28	1800	4.72	137	06-26	0500	8.77	460

4-1120. Sloan Creek near Williamston, Mich.

Location.--Lat 42°40'30", long 84°21'50", in E1/2 sec.1, T.3 N., R.1 W., on left bank 30 ft downstream from bridge on Meridian Road, 2 miles upstream from mouth, and 4 1/4 miles west of Williamston.

Drainage area.--9.34 sq mi.

Records available.--June 1954 to September 1968.

Gage.--Digital water-stage recorder and concrete control with V-notch sharp-crested weir. Datum of gage is 862.12 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to May 13, 1968, graphic water-stage recorder at same site and datum.

Average discharge.--14 years, 4.85 cfs.

Extremes.--Maximum discharge during year, 773 cfs June 25 (gage height, 7.84 ft); minimum, 0.24 cfs Oct. 6, 7 (gage height, 1.41 ft).

1954-68: Maximum discharge, 773 cfs June 25, 1968 (gage height, 7.84 ft) minimum, 0.01 cfs Sept. 11, 1954, Jan. 18, 1957 (gage height, 1.10 ft), caused by unusual regulation; minimum natural discharge, 0.02 cfs July 27, 1965 (gage height, 1.18 ft).

Remarks.--Records good.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.47	3.0	1.8	3.3	128	1.1	6.6	2.5	7.1	31	1.0	.45
2	.38	7.8	1.8	3.0	133	1.1	5.8	2.3	5.8	22	1.0	.59
3	.32	6.9	1.9	2.8	52	1.1	5.5	2.2	4.7	16	.87	.52
4	.29	9.6	1.8	2.5	33	1.1	25	2.1	3.8	12	.81	.44
5	.27	6.7	1.8	2.3	24	1.3	15	2.3	3.3	8.8	1.3	.41
6	.27	5.1	2.5	2.2	16	1.3	8.6	2.0	2.8	7.8	2.4	.39
7	.27	4.4	6.0	2.0	13	1.3	7.2	1.8	2.4	6.6	1.5	.36
8	.29	3.7	6.3	1.8	9.8	1.5	6.0	1.6	2.0	5.6	1.6	.34
9	.42	3.3	5.1	1.7	7.2	2.0	4.8	1.6	1.8	4.6	11	.35
10	.42	2.9	13	1.7	5.4	2.4	4.2	1.4	1.6	4.0	6.9	.45
11	.38	4.4	52	1.6	4.4	1.9	3.7	1.3	1.6	3.2	4.1	5.5
12	.36	6.6	66	1.6	3.7	1.6	3.5	1.4	1.7	2.5	2.6	5.2
13	.34	5.2	34	1.6	3.1	1.5	3.3	1.3	1.4	2.2	1.8	3.2
14	.38	4.7	21	1.6	2.7	1.5	3.7	1.7	1.2	1.9	1.4	1.6
15	.42	4.0	13	1.6	2.4	2.0	5.2	1.8	1.2	1.7	1.1	1.0
16	1.0	3.4	8.4	1.6	2.1	5.1	4.5	1.9	1.2	1.5	1.1	.78
17	1.3	3.4	6.7	1.6	1.9	4.8	3.9	1.8	1.3	1.3	1.1	.64
18	1.9	5.5	6.4	1.6	1.7	4.2	3.7	1.4	1.2	1.2	.93	.60
19	1.3	5.8	6.3	2.0	1.5	4.1	3.5	1.6	1.1	1.2	.84	.69
20	1.0	4.7	5.8	2.2	1.4	4.7	3.3	1.5	.95	1.1	.73	4.5
21	.84	4.0	82	2.5	1.3	5.1	3.4	1.3	4.2	.96	.68	5.0
22	.72	3.7	64	3.0	1.2	4.9	3.1	1.2	27	1.0	.64	3.1
23	.64	3.6	32	3.1	1.1	3.5	3.5	1.2	16	1.3	.58	3.2
24	.61	3.3	21	2.2	1.1	4.1	4.1	1.1	48	3.0	.55	3.3
25	.61	3.1	13	1.8	1.1	13	3.9	1.0	284	2.1	.60	5.5
26	.59	2.8	8.6	1.6	1.1	64	3.7	3.3	349	1.3	.57	4.0
27	1.9	2.5	6.6	1.7	1.1	38	3.4	39	120	1.1	.53	2.8
28	3.5	2.3	5.7	88	1.1	24	2.9	52	60	1.2	.45	2.0
29	2.7	2.1	4.8	75	1.1	15	2.7	28	54	.98	.46	1.5
30	2.1	2.0	4.4	56	------	9.4	2.7	17	50	.87	.44	1.3
31	1.8	------	3.9	31	------	8.0	------	11	------	.86	.43	------
TOTAL	27.79	130.5	507.6	306.2	456.5	234.6	160.4	191.6	1,060.35	150.87	50.01	59.71
MEAN	.90	4.35	16.4	9.88	15.7	7.57	5.35	6.18	35.3	4.87	1.61	1.99
MAX	3.5	9.6	82	88	133	64	25	52	349	31	11	5.5
MIN	.27	2.0	1.8	1.6	1.1	1.1	2.7	1.0	.95	.86	.43	.34
CFSM	.10	.47	1.75	1.06	1.69	.81	.57	.66	3.78	.52	.17	.21
IN.	.11	.52	2.02	1.22	1.82	.93	.64	.76	4.22	.60	.20	.24

CAL YR 1967 TOTAL 2,426.88 MEAN 6.65 MAX 82 MIN .17 CFSM .71 IN 9.66
WTR YR 1968 TOTAL 3,336.13 MEAN 9.12 MAX 349 MIN .27 CFSM .98 IN 13.28

PEAK DISCHARGE (BASE, 120 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-21	1800	4.05	152	06-25	2400	7.84	773
02-01	1700	4.48	214				

4-1125. Red Cedar River at East Lansing, Mich.

Location.--Lat 42°43'40", long 84°28'40", in SE1/4 sec.18, T.4 N., R.1 W., in left downstream bridge abutment of Farm Lane Bridge on Michigan State University Campus in East Lansing, 3 miles upstream from Sycamore Creek and 4 miles downstream from mouth.

Drainage area.--355 sq mi.

Records available.--August 1902 to December 1903, March 1931 to September 1968. Monthly discharge only for some periods, published in WSP 1307. Published as Red Cedar River at Agricultural College August 1902 to December 1903 and as Cedar River at East Lansing March 1931 to September 1965. Gage height records collected in this vicinity 1911-19, and for flood seasons only 1920-28, are contained in reports of U. S. Weather Bureau.

Gage.--Water-stage recorder and concrete control. Datum of gage is 824.39 ft above mean sea level, datum of 1929. August 1902 to December 1903 chain gage at site three-quarters of a mile downstream at different datum. March 1931 to November 1940 water-stage recorder at site 250 ft upstream at present datum.

Average discharge.--38 years, 197 cfs.

Extremes.--Maximum discharge during year, 2,960 cfs June 28 (gage height, 8.81 ft); minimum, 38 cfs Oct. 14, 15 (gage height, 3.25 ft).

1902-3, 1931-68: Maximum discharge, 5,920 cfs Apr. 7, 1947 (gage height, 11.58 ft); minimum, 3 cfs July 31, 1931.

Flood of Mar. 24, 1904, reached a stage of 13.4 ft (discharge, 8,000 cfs).

Remarks.--Records good. Occasional regulation at low flow by mill at Williamston 16 miles above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	51	115	92	149	1,140	91	490	163	540	2,280	111	66
2	49	143	94	140	2,090	97	423	149	466	1,910	117	72
3	45	167	97	130	2,400	85	383	146	403	1,550	108	69
4	44	206	94	120	1,890	88	444	142	347	1,230	97	69
5	44	213	94	115	1,570	99	570	142	291	975	102	64
6	44	196	99	108	1,260	111	505	142	236	800	135	61
7	45	176	122	105	1,000	114	440	135	188	710	132	58
8	53	161	149	103	820	120	399	126	160	605	129	55
9	57	149	152	100	640	142	355	120	135	505	230	53
10	60	137	176	97	355	166	319	117	117	427	391	64
11	62	140	373	95	300	177	283	111	114	383	375	108
12	64	146	645	93	260	166	254	111	114	335	355	126
13	55	152	720	92	230	129	236	108	99	295	355	94
14	40	152	580	92	210	126	222	114	91	258	339	83
15	44	149	441	92	190	149	287	120	94	226	307	72
16	62	131	369	91	170	177	315	126	91	205	291	61
17	75	120	314	92	150	226	283	126	91	184	268	55
18	94	128	283	94	142	254	261	120	99	163	233	55
19	97	149	258	99	135	261	247	123	97	149	198	64
20	87	152	241	109	129	272	230	120	94	135	170	142
21	80	143	482	120	117	291	219	117	105	120	146	152
22	73	137	982	128	108	295	216	111	216	105	129	114
23	68	134	1,050	137	102	275	212	102	331	114	108	105
24	64	128	810	125	99	240	212	99	448	170	99	114
25	62	122	590	115	94	283	205	97	910	184	94	123
26	60	117	468	109	91	560	202	129	1,890	156	91	129
27	73	115	322	102	91	860	194	343	2,800	142	85	114
28	109	107	260	201	97	835	177	735	2,940	135	77	102
29	128	99	230	610	97	725	163	845	2,770	129	72	94
30	120	97	190	1,050	------	640	163	775	2,540	120	66	83
31	112	------	170	1,150	------	555	------	640	------	111	69	------
TOTAL	2,121	4,281	10,947	5,963	15,977	8,609	8,909	6,554	18,817	14,811	5,479	2,621
MEAN	68.4	143	353	192	551	278	297	211	627	478	177	87.4
MAX	128	213	1,050	1,150	2,400	860	570	845	2,940	2,280	391	152
MIN	40	97	92	91	91	85	163	97	91	105	66	53
CFSM	.19	.40	.99	.54	1.55	.78	.84	.60	1.77	1.35	.50	.25
IN.	.22	.45	1.15	.62	1.67	.90	.93	.69	1.97	1.55	.57	.27

CAL YR 1967: TOTAL 76,841 MEAN 211 MAX 1,400 MIN 20 CFSM .59 IN 8.05
WAT YR 1968: TOTAL 105,089 MEAN 287 MAX 2,940 MIN 40 CFSM .81 IN 11.01

4-1130. Grand River at Lansing, Mich.

Location.--Lat 42°45'05", long 84°33'20", in NW1/4 sec.9, T.4 N., R.2 W., on right bank 30 ft upstream from bridge on North Grand River Avenue in Lansing, 2 miles downstream from Cedar River, and at mile 152.

Drainage area.--1,230 sq mi, approximately.

Records available.--March 1901 to September 1906, October 1934 to September 1968. Monthly discharge only for some periods, published in WSP 1307. Published as "at North Lansing" 1901-6. Gage-height records collected in this vicinity 1907-10 (flood seasons only), 1911-19, 1920-28 (flood seasons only), and since 1931 are contained in reports of U. S. Weather Bureau.

Gage.--Digital water-stage recorder. Datum of gage is 805.53 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to August 1906, staff gage at same site at different datum. November 1934 to June 1949 water-stage recorder at site 1 3/4 miles downstream at datum 2.42 ft lower. July 1949 to November 1962 graphic water-stage recorder at present site and datum.

Average discharge.--39 years, 797 cfs.

Extremes.--Maximum discharge during year, 8,560 cfs June 29 (gage height, 12.45 ft); minimum, 66 cfs Oct. 3; minimum gage height, 1.82 ft Aug. 30; minimum daily discharge, 138 cfs Oct. 3.

1901-6, 1934-68: Maximum discharge, 24,500 cfs Mar. 26, 1904 (gage height, 18.60 ft, datum then in use), from rating curve extended above 15,000 cfs by logarithmic plotting; minimum, 2.8 cfs Sept. 9, 1963 (gage height, 0.85 ft); minimum daily, 20 cfs Aug. 25, 1941.

Maximum discharge since at least 1901, 24,500 cfs Mar. 26, 1904.

Remarks.--Records good. Large diurnal fluctuation at medium and low flows caused by powerplants above station. Records of water temperature for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	208	580	337	865	3,670	508	1,620	702	2,450	6,810	1,130	382
2	220	680	418	824	5,760	540	1,490	612	2,150	5,810	1,070	314
3	138	770	395	775	6,000	545	1,450	607	1,850	4,850	956	386
4	158	905	391	800	5,330	499	1,610	645	1,690	4,170	895	337
5	155	860	368	729	4,830	499	1,780	550	1,560	3,620	982	440
6	148	829	458	670	4,060	517	1,830	535	1,430	3,240	969	463
7	148	815	404	655	3,450	526	1,780	580	1,280	3,000	964	454
8	224	761	585	660	3,010	693	1,790	540	1,200	2,780	860	395
9	180	729	598	458	2,450	670	1,620	481	1,060	2,500	1,200	337
10	138	693	795	499	1,700	756	1,500	481	978	2,240	1,330	458
11	169	729	1,310	535	1,430	815	1,400	458	1,000	2,100	1,380	454
12	173	684	1,970	485	1,360	960	1,280	368	942	1,840	1,350	521
13	188	660	2,090	485	1,510	655	1,230	382	890	1,640	1,320	499
14	228	665	1,920	458	1,440	725	1,220	472	875	1,520	1,170	521
15	232	616	1,660	463	1,490	734	1,240	458	805	1,370	1,080	494
16	274	526	1,500	440	1,300	738	1,270	481	756	1,250	1,100	467
17	391	454	1,320	418	1,170	856	1,230	494	716	1,130	905	373
18	427	565	1,240	458	851	946	1,200	449	716	1,090	820	395
19	517	621	1,170	512	942	1,050	1,130	526	640	964	725	382
20	756	640	1,100	485	880	1,080	1,100	665	472	856	752	900
21	445	650	1,900	521	743	1,090	1,140	503	630	838	625	560
22	368	616	2,680	603	607	1,120	1,000	458	833	738	702	431
23	409	621	2,950	607	655	1,240	1,030	454	1,100	765	490	545
24	377	594	2,560	575	545	1,120	1,030	368	1,790	875	640	607
25	377	585	2,210	535	526	1,240	991	476	2,760	824	481	598
26	364	499	1,760	521	494	1,610	964	689	5,130	942	445	640
27	391	499	1,300	472	503	2,180	910	1,400	6,880	1,200	467	680
28	476	454	1,340	1,030	508	2,370	780	2,150	7,830	1,280	440	598
29	580	454	1,170	2,060	512	2,280	775	2,480	8,320	1,300	368	555
30	585	445	1,140	3,030	------	2,090	743	2,740	7,840	1,280	391	503
31	521	------	1,150	3,040	------	1,910	------	2,650	------	1,260	395	------
TOTAL	9,965	19,199	40,189	24,668	57,726	32,562	38,133	24,854	66,573	64,082	26,442	14,689
MEAN	321	640	1,296	796	1,991	1,050	1,271	802	2,219	2,067	853	490
MAX	756	905	2,950	3,040	6,000	2,370	1,830	2,740	8,320	6,810	1,380	900
MIN	138	445	337	418	494	499	743	368	472	738	368	314
CFSM	.26	.52	1.05	.65	1.62	.85	1.03	.65	1.80	1.68	.69	.40
IN.	.30	.58	1.22	.75	1.75	.98	1.15	.75	2.01	1.94	.80	.44

CAL YR 1967: TOTAL 274,249 MEAN 751 MAX 3,530 MIN 117 CFSM .61 IN. 8.29
WTR YR 1968: TOTAL 419,082 MEAN 1,145 MAX 8,320 MIN 138 CFSM .93 IN. 12.67

4-1140. Grand River at Portland, Mich.

Location.--Lat 42°51'20", long 84°54'45", in NW1/4 sec.4, T.5 N., R.5 W., on left bank at downstream side of bridge on Kent Street, 1.0 mile south of Portland, 1.9 miles upstream from Lookingglass River, and at mile 115.

Drainage area.--1,385 sq mi.

Records available.--August 1952 to September 1968. Gage-height records for flood seasons collected in this vicinity 1907-28 are contained in reports of U. S. Weather Bureau.

Gage.--Digital water-stage recorder. Datum of gage is 705.00 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to July 6, 1953, wire-weight gage and July 6, 1953 to Sept. 25, 1964, graphic water-stage recorder at same site and datum.

Average discharge.--16 years, 777 cfs.

Extremes.--Maximum discharge during year, 7,840 cfs June 20 (gage height, 11.57 ft); maximum gage height, 11.77 ft Feb. 12 (backwater from ice); minimum discharge, 212 cfs Oct. 4, 5 (gage height, 4.55 ft); minimum daily, 238 cfs Oct. 5, 7.

1952-68: Maximum discharge, 9,100 cfs May 13, 1956; maximum gage height, 11.77 ft Feb. 12, 1968 (backwater from ice); minimum discharge, 38 cfs Oct. 10, 1963; minimum daily, 58 cfs Oct. 9, 1963.

Remarks.--Records good except those for the winter periods, which are fair. Slight diurnal fluctuation caused by powerplants above station. Records of water temperature for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	354	691	565	1,200	4,150	560	1,900	802	2,540	6,960	1,370	429
2	259	878	466	960	5,880	560	1,680	746	2,290	6,190	1,220	437
3	283	899	552	900	6,860	600	1,550	638	1,980	5,360	1,150	361
4	250	1,080	518	840	6,380	590	1,690	664	1,810	4,590	1,060	419
5	238	1,100	504	900	5,720	543	1,840	664	1,620	3,930	963	393
6	245	1,030	508	800	5,050	540	1,970	571	1,510	3,470	1,280	490
7	238	996	623	750	4,220	557	1,910	565	1,370	3,160	1,050	501
8	246	969	600	750	3,610	571	1,930	607	1,260	2,920	1,030	489
9	293	898	745	750	3,080	750	1,760	583	1,160	2,810	978	462
10	353	875	773	520	2,480	708	1,640	523	1,010	2,530	1,320	457
11	245	887	1,410	560	2,010	802	1,530	523	970	2,340	1,430	677
12	251	929	2,340	600	1,600	886	1,430	511	1,020	2,150	1,440	550
13	282	853	2,770	540	1,500	910	1,310	420	922	1,920	1,410	580
14	287	858	2,550	540	1,700	714	1,270	445	906	1,760	1,360	550
15	337	855	2,260	560	1,600	838	1,730	584	890	1,610	1,210	580
16	368	778	1,910	560	1,700	740	1,490	559	815	1,490	1,150	540
17	469	704	1,700	560	1,500	806	1,440	592	773	1,360	1,210	507
18	511	647	1,520	560	1,300	931	1,330	572	752	1,230	945	435
19	559	744	1,400	560	950	1,010	1,300	548	760	1,150	951	477
20	605	777	1,330	560	1,050	1,100	1,200	574	682	1,020	807	550
21	875	792	1,530	540	950	1,140	1,220	695	549	943	781	1,030
22	545	802	3,190	600	840	1,150	1,180	559	959	906	673	630
23	461	763	3,300	700	700	1,210	1,090	523	938	839	740	500
24	499	747	3,170	700	740	1,230	1,160	518	1,990	1,080	554	643
25	505	731	2,690	640	600	1,250	1,110	437	2,340	1,030	654	702
26	486	709	2,330	600	600	1,570	1,090	543	5,060	969	521	676
27	506	619	1,990	580	550	2,170	1,040	1,020	6,630	1,050	493	716
28	551	628	1,610	540	560	2,600	952	2,030	7,050	1,400	511	743
29	636	580	1,510	1,300	560	2,460	837	2,360	7,540	1,370	493	657
30	757	577	1,280	2,300	------	2,350	753	2,640	7,740	1,410	428	613
31	746	------	1,250	3,630	------	2,150	------	2,710	------	1,370	429	------
TOTAL	13,240	24,396	48,894	26,100	68,440	33,996	42,332	25,726	65,836	70,317	29,611	16,794
MEAN	427	813	1,577	842	2,360	1,097	1,411	830	2,195	2,268	955	560
MAX	875	1,100	3,300	3,630	6,860	2,600	1,970	2,710	7,740	6,960	1,440	1,030
MIN	238	577	466	520	550	540	753	420	549	839	428	361
CFSM	.31	.59	1.14	.61	1.70	.79	1.02	.60	1.58	1.64	.69	.40
IN.	.36	.66	1.31	.70	1.84	.91	1.14	.69	1.77	1.89	.80	.45

CAL YR 1967 TOTAL 338,208 MEAN 927 MAX 4,270 MIN 155 CFSM .67 IN 9.08
WTR YR 1968 TOTAL 465,682 MEAN 1,272 MAX 7,740 MIN 238 CFSM .92 IN 12.50

4-1145. Lookingglass River near Eagle, Mich.

Location.--Lat 42°49'45", long 84°46'40", in sec.10, T.5 N., R.4 W., on right bank at upstream side of highway bridge, 1 1/2 miles northeast of Eagle and 10 miles upstream from mouth.

Drainage area.--281 sq mi.

Records available.--August 1944 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 747.09 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to June 2, 1962, wire-weight gage and June 3, 1962, to May 13, 1968, graphic water-stage recorder at same site and datum.

Average discharge.--24 years, 158 cfs.

Extremes.--Maximum discharge during year, 965 cfs June 24 (gage height, 4.77 ft); maximum gage height, 8.08 ft Feb. 2 (backwater from ice); minimum discharge, 32 cfs Oct. 7, 8 (gage height, 1.42 ft).
1944-68: Maximum discharge, 2,860 cfs Apr. 5, 1947 (gage height, 7.70 ft, from graph based on gage readings) from rating curve extended above 1,900 cfs by logarithmic plotting; maximum gage height, 9.9 ft Mar. 7, 1956 (ice jam), from high water mark; minimum discharge, 10 cfs July 28, 1965 (gage height, 1.01 ft).

Remarks.--Records good except those for winter periods, which are fair. Small intermittent diversion at times into Lake Geneva when discharge is above 50 cfs.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	47	95	105	150	700	90	375	140	300	611	69	45
2	46	124	105	140	900	90	383	133	320	572	65	45
3	44	126	99	130	800	90	383	124	327	544	62	43
4	41	153	98	120	740	90	404	119	332	530	59	43
5	38	146	92	110	700	90	391	113	329	530	58	42
6	35	144	96	110	600	90	370	107	320	524	74	41
7	32	150	107	100	550	95	351	101	303	514	62	39
8	34	148	118	95	500	100	332	98	279	499	60	38
9	41	148	124	90	400	110	310	93	248	478	59	39
10	39	142	146	90	300	130	303	89	206	450	56	43
11	38	152	286	85	250	140	288	85	169	417	52	49
12	37	153	442	85	230	140	269	85	150	383	50	47
13	38	146	353	80	230	130	245	82	121	348	49	45
14	39	150	315	80	230	120	288	85	102	308	46	45
15	40	153	305	80	220	130	404	87	89	269	45	43
16	51	150	290	80	210	150	317	93	79	239	46	41
17	55	148	280	80	200	161	281	93	73	200	51	40
18	58	150	260	82	180	184	262	95	69	169	53	40
19	58	146	250	84	160	209	243	96	67	153	98	41
20	58	144	250	84	150	227	232	93	64	128	92	49
21	58	144	456	84	130	234	241	90	65	110	93	54
22	55	146	514	95	120	234	218	87	108	93	95	70
23	53	146	442	100	110	232	202	86	191	83	95	79
24	52	144	400	100	100	220	195	82	623	104	93	85
25	51	140	350	95	90	227	193	76	346	89	89	85
26	50	137	300	85	90	334	182	83	718	82	78	82
27	52	129	250	90	90	329	172	152	750	89	69	80
28	60	124	220	150	90	315	163	286	619	104	60	79
29	61	110	200	400	90	320	155	303	639	85	54	76
30	82	108	180	600	------	336	152	291	696	78	50	73
31	83	------	160	600	------	358	------	288	------	74	46	------
TOTAL	1,526	4,196	7,593	4,354	9,160	5,705	8,304	3,835	8,702	8,857	2,028	1,621
MEAN	49.2	140	245	140	316	184	277	124	290	286	65.4	54.0
MAX	83	153	514	600	900	358	404	303	750	611	98	85
MIN	32	95	92	80	90	90	152	76	64	74	45	38
CFSM	.18	.50	.87	.50	1.12	.65	.99	.44	1.03	1.02	.23	.19
IN.	.20	.56	1.00	.58	1.21	.76	1.10	.51	1.15	1.17	.27	.21

CAL YR	1967:	TOTAL	70,332	MEAN	193	MAX	1,160	MIN	27	CFSM	.69	IN. 9.31
WTR YR	1968:	TOTAL	65,881	MEAN	180	MAX	900	MIN	32	CFSM	.64	IN. 8.72

4-1150. Maple River at Maple Rapids, Mich.

Location.--Lat 43°06'35", long 84°41'35", in sec.5, T.8 N., R.3 W., on upstream side of highway bridge at Maple Rapids, 30 ft downstream from Pine Creek and three-quarters of a mile upstream from Hayworth Creek.

Drainage area.--434 sq mi.

Records available.--August 1944 to September 1968.

Gage.--Wire-weight gage read twice daily. Datum of gage is 642.58 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources).

Average discharge.--24 years, 232 cfs.

Extremes.--Maximum discharge during year, 2,250 cfs Feb. 7 (gage height, 9.00 ft); maximum gage height, 9.03 ft Dec. 18; minimum discharge, 28 cfs Oct. 1 (gage height, 3.10 ft).

1944-68: Maximum daily discharge, 6,500 cfs Mar. 20, 1948; maximum gage height, 11.22 ft Mar. 20, 1948, from flood mark (backwater from ice); minimum discharge, 4.4 cfs Aug. 13, 1965 (gage height, 1.62 ft).

Flood in March 1904 reached a stage of 13.8 ft, from information by local resident.

Remarks.--Records poor.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	28	87	153	310	350	95	585	254	648	580	82	85
2	36	103	145	260	300	90	572	223	640	605	79	80
3	38	119	140	230	250	86	542	231	620	599	77	77
4	37	127	131	210	250	82	518	220	562	600	80	70
5	35	140	134	190	337	79	578	210	484	590	82	66
6	33	159	127	170	1,010	77	493	194	445	522	64	62
7	31	175	127	155	1,930	81	470	177	401	540	68	59
8	32	185	137	140	1,660	80	447	168	368	570	59	56
9	33	188	146	133	1,380	82	438	155	335	410	57	54
10	32	202	170	130	900	88	407	147	307	359	56	59
11	33	204	208	124	700	94	372	141	271	328	52	58
12	33	220	337	120	528	100	344	115	249	291	47	57
13	33	236	628	115	435	110	317	92	225	258	41	57
14	34	244	746	110	370	120	300	125	211	230	41	57
15	37	248	929	108	320	130	287	113	193	208	34	56
16	43	258	833	104	280	142	273	114	180	174	33	53
17	44	254	1,200	101	250	145	267	114	162	167	30	50
18	43	256	1,720	97	220	147	287	108	152	156	60	48
19	45	250	1,430	94	200	171	307	100	145	150	115	46
20	45	237	1,200	90	180	172	307	96	135	129	129	46
21	47	236	1,060	85	170	186	300	94	132	120	146	46
22	48	229	588	80	160	189	299	87	128	115	157	48
23	50	216	596	75	145	200	256	87	128	106	150	50
24	49	210	600	70	133	195	277	84	125	103	148	52
25	49	208	600	74	123	190	275	78	117	95	135	56
26	50	195	593	76	110	210	277	100	136	87	125	57
27	49	179	575	80	107	267	275	135	211	51	121	57
28	47	165	528	86	102	223	272	226	277	66	112	57
29	56	166	478	100	100	480	271	390	443	87	108	55
30	66	165	420	110	------	562	246	436	510	80	96	53
31	80	------	360	150	------	580	------	640	------	84	91	------
TOTAL	1,316	5,861	17,039	3,977	13,000	5,453	10,859	5,454	8,940	8,460	2,675	1,727
MEAN	42.5	195	550	128	448	176	362	176	298	273	86.3	57.6
MAX	80	258	1,720	310	1,930	580	585	640	648	605	157	85
MIN	28	87	127	70	100	77	246	78	117	51	30	46
CFSM	.10	.45	1.27	.30	1.03	.41	.83	.41	.69	.63	.20	.13
IN.	.11	.50	1.46	.34	1.11	.47	.93	.47	.77	.72	.23	.15

CAL YR 1967: TOTAL 127,731	MEAN 350	MAX 3,330	MIN 10	CFSM .81	IN 10.95
WAT YR 1968: TOTAL 84,761	MEAN 232	MAX 1,930	MIN 28	CFSM .53	IN 7.26

4-1160. Grand River at Ionia, Mich.

Location.--Lat 42°58'20", long 85°04'10", in NW1/4 sec.30, T.7 N., R.6 W., on left bank 15 ft downstream from bridge on State Highway 66 at Ionia, 2.7 miles downstream from Prairie Creek and at mile 87.

Drainage area.--2,840 sq mi, approximately.

Records available.--March to June 1931, July and September 1931 (fragmentary), July 1951 to September 1968. Gage-height records for flood seasons collected in this vicinity 1907-28 are contained in reports of U. S. Weather Bureau.

Gage.--Digital water-stage recorder. Datum of gage is 615.38 ft above mean sea level, datum of 1929. Mar. 19 to Sept. 24, 1931, chain gage at site 1 1/2 miles upstream at different datum. July 20, 1951, to Nov. 13, 1962, graphic water-stage recorder at present site and datum.

Average discharge.--17 years (1951-68), 1,644 cfs.

Extremes.--Maximum discharge during year, 13,600 cfs Feb. 4 (gage height, 20.48 ft); minimum, 40 cfs May 13 (gage height, 5.61 ft); minimum daily, 443 cfs Oct. 12.
1931, 1951-68: Maximum discharge, 21,500 cfs Apr. 1, 1960 (gage height, 23.43 ft); minimum, 40 cfs May 13, 1968 (gage height, 5.61 ft); minimum daily, 115 cfs Aug. 27, 1953.

Remarks.--Records good except those for the winter period and those for periods of no gage-height record, which are fair. Diurnal fluctuation below about 5,000 cfs caused by powerplants above station. Records of water temperature for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	616	1,300	1,200	2,000	8,790	1,100	4,600	1,570	4,520	12,000	1,630	730
2	700	1,510	1,210	1,600	11,400	1,200	4,200	1,650	4,360	11,300	1,860	705
3	578	1,800	1,060	1,900	13,100	1,100	3,800	1,450	4,050	10,200	1,490	670
4	511	1,950	1,270	2,000	13,600	1,300	4,000	1,060	3,680	7,850	1,470	641
5	521	1,940	1,060	1,500	13,000	1,400	4,400	1,150	3,420	7,370	1,320	590
6	502	2,060	1,170	1,200	12,000	1,290	4,200	1,280	3,200	6,380	1,330	715
7	474	1,870	1,280	1,700	10,000	1,170	4,100	975	2,950	5,540	1,620	720
8	452	1,760	1,560	1,400	9,000	1,230	4,100	820	2,690	4,910	1,530	785
9	474	1,810	1,580	1,100	8,000	1,330	3,900	964	2,520	4,510	1,440	760
10	646	1,680	1,560	1,400	6,000	1,540	3,500	890	2,280	4,230	1,200	969
11	573	1,690	2,140	1,100	5,000	1,660	3,000	735	2,070	3,970	1,630	997
12	443	1,990	4,460	1,300	4,000	1,660	2,800	710	1,990	3,230	1,710	964
13	452	1,870	5,630	1,200	3,500	1,560	2,500	497	1,890	3,090	1,740	920
14	549	1,930	5,800	1,200	3,000	1,660	2,000	588	1,720	2,880	1,680	840
15	607	1,900	5,430	1,400	3,000	1,450	2,800	1,080	1,650	2,650	1,580	815
16	705	1,850	4,720	1,000	3,000	1,670	3,700	1,740	1,550	2,450	1,450	765
17	755	1,740	4,170	1,000	2,700	1,800	2,500	1,780	1,390	2,310	1,630	750
18	795	1,620	3,800	1,150	1,600	1,570	2,500	1,840	1,330	2,040	1,620	755
19	947	1,620	3,500	1,100	2,200	2,320	2,500	1,170	1,300	1,880	1,290	715
20	953	1,710	3,300	1,200	1,400	2,520	2,400	1,690	1,240	1,650	1,390	820
21	1,060	1,750	3,930	1,200	2,300	2,320	2,400	1,530	1,090	1,610	1,340	865
22	920	1,740	4,730	1,250	1,800	2,950	2,300	1,400	1,100	1,240	1,190	1,220
23	805	1,660	5,530	1,400	1,300	2,420	2,200	1,190	1,570	1,410	1,180	905
24	770	1,640	5,480	1,500	1,300	2,540	2,000	1,130	3,270	1,330	1,110	860
25	805	1,650	5,020	1,000	1,600	3,050	2,500	1,090	4,130	1,620	991	942
26	815	1,560	4,300	1,200	1,400	3,450	2,000	1,080	5,330	1,500	975	1,030
27	855	1,420	3,800	1,400	1,300	4,300	2,000	1,450	8,150	1,390	895	980
28	1,010	1,360	3,400	1,300	1,200	5,400	2,200	2,880	9,970	1,730	830	1,050
29	947	1,330	3,000	2,500	1,150	5,600	1,630	3,950	11,000	1,970	825	1,030
30	1,300	1,230	2,700	3,500	------	5,400	1,440	4,300	11,900	1,990	770	920
31	1,450	------	2,300	7,640	------	5,000	------	4,550	------	1,890	735	------
TOTAL	22,990	50,940	100,090	51,340	147,640	72,960	88,170	48,189	107,360	118,120	41,451	25,528
MEAN	742	1,698	3,229	1,656	5,091	2,354	2,939	1,554	3,579	3,810	1,337	851
MAX	1,450	2,060	5,800	7,640	13,600	5,600	4,600	4,550	11,900	12,000	1,860	1,220
MIN	443	1,230	1,060	1,000	1,150	1,100	1,440	497	1,090	1,240	735	641
CFSM	.26	.60	1.14	.58	1.79	.83	1.03	.55	1.26	1.34	.47	.30
IN.	.30	.67	1.31	.67	1.93	.96	1.15	.63	1.41	1.55	.54	.33

CAL YR 1967: TOTAL 785,106 MEAN 2,151 MAX 10,900 MIN 341 CFSM .76 IN. 10.28
WTR YR 1968: TOTAL 874,778 MEAN 2,390 MAX 13,600 MIN 443 CFSM .84 IN. 11.46

Note.--No gage-height record Dec. 27 to Jan. 31, Feb. 5 to Mar. 5, Mar. 27 to Apr. 28.

4-1165. Flat River at Smyrna, Mich.

Location.--Lat 43°03'10", long 85°15'50", in NW1/4 sec.28, T.8 N., R.8 W., on right bank at downstream side of highway bridge, 600 ft downstream from dam and inactive powerplant and half a mile south of Smyrna.

Drainage area.--528 sq mi.

Records available.--October 1950 to September 1968. Monthly discharge only for some periods, published in WSP 1727.

Gage.--Digital water-stage recorder. Datum of gage is 729.53 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Jan. 11, 1966, graphic water-stage recorder at same site and datum.

Average discharge.--18 years, 401 cfs.

Extremes.--Maximum discharge during year, 1,550 cfs Feb. 5 (gage height, 5.74 ft); maximum gage height, 6.55 ft Jan. 7 (ice jam); minimum discharge, 85 cfs Mar. 15 (gage height, 2.83 ft); minimum daily discharge, 177 cfs Aug. 31, Sept. 1.

1950-68: Maximum discharge, 3,100 cfs Apr. 22, 1967 (gage height, 7.27 ft caused by momentary release of water from storage above station); minimum, 7.4 cfs Sept. 9, 1953; minimum daily, 70 cfs Sept. 6, 1964.

Remarks.--Records good except those for the winter period, which are fair. Diurnal fluctuation caused by powerplants above station prior to September 1956; occasional diurnal fluctuation since.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	368	483	444	400	780	329	734	453	955	711	202	177
2	368	657	428	400	970	339	683	529	989	617	201	184
3	303	641	367	400	1,000	307	603	464	863	590	200	188
4	322	682	392	400	966	349	695	434	713	485	267	189
5	301	667	508	400	1,140	373	690	381	708	407	246	190
6	290	660	416	400	1,200	370	656	375	632	418	191	191
7	313	657	435	400	1,020	370	691	398	462	394	205	190
8	284	562	470	400	939	394	677	468	442	373	223	137
9	258	650	486	400	769	407	650	398	395	310	267	194
10	300	612	505	400	521	442	608	331	370	385	261	215
11	331	587	564	400	470	456	501	396	284	313	220	224
12	314	667	827	400	450	473	489	313	375	279	208	212
13	398	635	704	400	420	437	469	415	382	244	207	208
14	392	581	840	400	390	439	453	380	269	213	204	203
15	329	664	806	400	370	366	517	373	279	270	202	202
16	406	574	800	400	350	413	498	497	273	242	202	199
17	438	571	724	400	350	465	585	494	270	253	206	200
18	457	643	764	390	350	468	536	484	256	238	199	214
19	476	623	690	370	340	480	595	492	314	214	200	223
20	454	581	658	360	340	511	528	499	327	220	201	229
21	436	483	599	340	330	591	537	523	251	213	199	228
22	418	496	623	320	330	575	598	550	222	215	198	226
23	399	588	658	310	320	528	522	535	213	196	195	231
24	380	499	612	300	320	593	529	487	357	183	192	312
25	352	502	601	300	326	536	611	501	441	208	187	305
26	356	546	487	300	328	550	610	445	494	206	185	277
27	386	513	450	300	333	721	557	654	746	206	185	240
28	399	395	430	330	336	689	594	786	744	208	184	253
29	412	394	400	370	334	748	560	853	723	222	181	240
30	430	396	400	450	------	717	462	999	665	210	178	236
31	445	------	400	600	------	671	------	1,050	------	188	177	------
TOTAL	11,515	17,209	17,488	11,840	16,092	15,107	17,438	15,957	14,414	9,431	6,373	6,567
MEAN	371	574	564	382	555	487	581	515	480	304	206	219
MAX	476	682	840	600	1,200	748	734	1,050	989	711	267	312
MIN	258	394	367	300	320	307	453	313	213	183	177	177
CFSM	.70	1.09	1.07	.72	1.05	.92	1.10	.98	.91	.58	.39	.41
IN.	.81	1.21	1.23	.83	1.13	1.06	1.23	1.12	1.02	.66	.45	.46

CAL YR 1967:	TOTAL	212,673	MEAN	583	MAX	2,320	MIN	188	CFSM	1.10	IN.	14.97
WTR YR 1968:	TOTAL	159,431	MEAN	436	MAX	1,200	MIN	177	CFSM	.83	IN.	11.21

4-1170. Quaker Brook near Nashville, Mich.

Location.--Lat 42°33'57", long 85°05'37", in NW¼ sec.13, T.2 N., R.7 W., on left bank 150 ft upstream from culvert on county road, 500 ft upstream from small tributary, and 2½ miles south of Nashville.

Drainage area.--7.60 sq mi.

Records available.--August 1954 to September 1968.

Gage.--Digital water-stage recorder and concrete control. Datum of gage is 821.89 ft above mean sea level, datum of 1929 (levels by Michigan Department of Conservation). Prior to Sept. 29, 1966, graphic water-stage recorder at same site and datum.

Average discharge.--14 years, 5.31 cfs.

Extremes.--Maximum discharge during year, 139 cfs Feb. 1 (gage height, 4.32 ft); minimum, 1.3 cfs Mar. 4 (gage height, 1.68 ft).
1954-68: Maximum discharge, 294 cfs Oct. 4, 1954 (gage height, 5.47 ft), from rating curve extended above 140 cfs; minimum, 0.44 cfs Nov. 3, 1966 (gage height, 1.68 ft).

Remarks.--Records good.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.5	8.7	3.8	4.0	93	3.6	6.2	4.7	5.7	6.5	4.9	2.9
2	3.7	18	4.1	3.8	88	3.6	5.4	4.4	5.3	4.8	3.6	3.5
3	3.3	12	4.6	4.2	24	3.4	5.6	4.5	4.4	4.3	3.2	3.0
4	3.1	17	4.7	4.3	14	3.6	17	4.6	4.0	4.0	3.1	2.8
5	3.3	11	5.2	4.0	11	4.1	10	4.5	3.8	4.4	5.3	2.8
6	3.2	8.5	6.1	4.0	9.0	4.1	6.6	4.2	3.7	4.0	8.6	2.8
7	3.1	7.3	7.4	3.9	8.7	4.1	5.9	4.1	3.5	3.6	6.2	2.6
8	3.6	6.9	7.5	3.8	7.9	4.5	5.2	4.1	3.4	3.7	5.7	2.6
9	7.2	6.5	6.0	3.9	5.7	5.6	4.6	4.0	3.3	3.9	15	3.5
10	5.4	5.9	7.1	4.1	4.4	5.8	4.4	3.8	3.3	3.4	6.0	12
11	4.3	9.2	19	4.0	3.7	5.1	4.3	4.1	3.5	3.2	3.9	27
12	3.9	9.0	40	3.8	3.7	4.3	4.1	4.3	3.7	3.1	3.5	8.1
13	3.9	6.6	17	4.0	3.6	4.5	4.0	4.0	3.4	3.0	3.2	4.3
14	4.9	6.5	9.6	4.3	3.7	4.4	32	7.5	3.2	2.9	3.1	3.7
15	5.2	7.0	6.5	4.5	3.7	5.0	43	6.6	3.6	2.9	2.9	3.3
16	13	5.4	5.5	4.4	3.8	6.3	13	9.1	3.4	2.8	6.0	3.2
17	12	6.0	5.4	4.5	3.5	6.3	8.1	7.0	3.3	2.7	6.7	3.1
18	8.4	7.6	6.9	4.9	3.2	6.3	8.8	5.1	3.5	3.3	4.5	4.4
19	5.6	6.8	7.0	5.4	3.1	6.8	7.2	7.6	3.6	4.1	3.7	5.8
20	4.5	5.4	5.9	5.4	3.3	7.1	6.9	6.0	3.2	3.1	3.4	8.0
21	4.1	5.2	56	5.3	3.0	6.8	11	4.9	4.0	2.9	3.2	5.5
22	4.0	5.4	41	5.2	3.0	6.2	7.3	4.3	5.7	2.8	3.0	5.0
23	3.9	5.6	14	4.8	3.0	4.9	6.8	4.4	4.3	3.3	2.9	5.6
24	3.8	5.1	9.4	4.4	3.2	6.3	7.4	4.2	5.9	16	2.8	5.3
25	6.3	4.9	8.6	3.7	3.2	9.2	7.9	3.8	12	9.8	2.6	5.8
26	5.9	4.7	6.7	3.8	3.1	21	6.6	7.3	48	4.0	2.7	4.3
27	6.4	4.4	6.0	4.2	3.3	14	5.8	14	37	3.9	2.7	3.9
28	10	4.2	5.9	20	3.6	9.8	5.3	16	20	4.0	2.6	3.6
29	10	4.0	4.9	50	3.7	8.1	5.4	16	12	3.3	2.5	3.5
30	14	4.3	5.3	37	------	6.8	5.1	8.3	13	3.0	2.5	3.4
31	8.5	------	4.8	15	------	6.7	------	6.3	------	3.8	2.5	------
TOTAL	183.0	219.1	341.9	238.6	330.1	198.3	270.9	193.7	236.7	130.5	132.5	155.3
MEAN	5.90	7.30	11.0	7.70	11.4	6.40	9.03	6.25	7.89	4.21	4.27	5.18
MAX	14	18	56	50	93	21	43	16	48	16	15	27
MIN	3.1	4.0	3.8	3.7	3.0	3.4	4.0	3.8	3.2	2.7	2.5	2.6
CFSM	.78	.96	1.45	1.01	1.50	.84	1.19	.82	1.04	.55	.56	.68
IN.	.90	1.07	1.67	1.17	1.62	.97	1.33	.95	1.16	.64	.65	.76

CAL YR 1967 TOTAL 2,569.4 MEAN 7.04 MAX 56 MIN 2.3 CFSM .93 IN 12.57
WTR YR 1968 TOTAL 2,630.6 MEAN 7.19 MAX 93 MIN 2.5 CFSM .95 IN 12.87

PEAK DISCHARGE (BASE, 50 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-12	0900	2.91	59	02-01	1400	4.32	139
12-21	1600	3.60	110	04-14	2100	3.72	114
01-29	2000	3.23	85	06-26	0400	3.02	72

4-1175. Thornapple River near Hastings, Mich.

Location.--Lat 42°36'55", long 85°14'15", in sec.27, T.3 N., R.8 W., on downstream side of highway bridge, half a mile downstream from Cedar Creek, 2 miles downstream from Thornapple Lake, and 3 1/2 miles southeast of Hastings.

Drainage area.--385 sq mi.

Records available.--October 1944 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 786.71 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Oct. 1, 1965, wire-weight gage at same site and datum.

Average discharge.24 years, 281 cfs.

Extremes.--Maximum discharge during year, 2,600 cfs Feb. 4 (gage height, 7.17 ft); minimum, 83 cfs Oct. 8 (gage height, 2.96 ft).
1944-68: Maximum discharge, 6,810 cfs Apr. 7, 1947 (gage height, 10.20 ft, from graph based on gage readings); minimum, 33 cfs Aug. 10, 1964 (gage height, 2.71 ft).

Remarks.--Records good.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	120	276	197	363	1,340	170	500	296	415	1,530	158	110
2	118	314	188	296	1,990	173	450	268	376	1,500	161	118
3	110	354	185	260	2,390	161	405	251	318	1,350	155	120
4	105	400	182	250	2,570	167	410	242	268	1,150	143	122
5	98	430	185	240	2,480	179	455	230	227	984	146	122
6	95	445	194	220	2,190	188	495	221	200	815	188	118
7	86	430	212	220	1,830	197	505	209	179	634	224	115
8	85	405	239	210	1,450	203	465	194	164	485	233	110
9	95	372	264	200	1,140	221	430	188	152	372	236	110
10	110	332	272	200	875	245	386	179	143	292	245	130
11	120	318	314	200	606	257	345	170	135	245	242	185
12	120	314	495	200	500	257	309	161	143	215	224	221
13	115	322	755	190	430	233	284	152	143	194	203	227
14	112	332	914	190	381	224	284	158	135	188	185	203
15	118	336	948	190	345	224	358	176	135	158	164	179
16	132	314	908	190	309	239	515	185	132	149	188	161
17	161	292	839	190	260	260	656	200	128	140	221	146
18	182	280	744	200	240	284	755	206	122	132	236	155
19	185	276	634	206	230	300	755	203	120	140	230	167
20	176	272	535	212	224	314	684	200	118	140	209	176
21	161	268	515	209	206	318	585	194	118	132	188	185
22	149	254	623	200	191	318	530	179	140	125	170	200
23	135	248	797	200	188	318	485	167	155	122	158	206
24	132	239	930	190	182	314	445	158	182	167	146	224
25	132	233	984	180	179	318	430	146	242	215	135	227
26	138	221	924	180	170	372	410	146	450	224	128	218
27	158	215	821	180	170	485	386	182	672	209	122	206
28	173	209	744	200	173	575	363	248	863	194	120	194
29	194	203	634	327	170	623	340	336	1,070	188	115	176
30	224	197	530	662	------	612	314	405	1,360	173	112	164
31	254	------	445	954	------	560	------	425	------	155	108	------
TOTAL	4,293	9,101	17,151	7,909	23,409	9,309	13,734	6,675	9,005	12,717	5,493	4,995
MEAN	138	303	553	255	807	300	458	215	300	410	177	167
MAX	254	445	984	954	2,570	623	755	425	1,360	1,530	245	227
MIN	85	197	182	180	170	161	284	146	118	122	108	110
CFSM	.36	.79	1.44	.66	2.10	.78	1.19	.56	.78	1.07	.46	.43
IN.	.41	.88	1.66	.76	2.26	.90	1.33	.64	.87	1.23	.53	.48

CAL YR 1967: TOTAL 119,996 MEAN 329 MAX 1,740 MIN 76 CFSM .85 IN 11.59
WAT YR 1968: TOTAL 123,791 MEAN 338 MAX 2,570 MIN 85 CFSM .88 IN 11.96

4-1180. Thornapple River near Caledonia, Mich.

Location.—Lat 42°48'40", long 85°29'00", in NW¼ sec.22, T.5 N., R.10 W., on right bank 200 ft downstream from La Barge powerplant, 2.3 miles northeast of Caledonia, and 3.3 miles downstream from Coldwater River.

Drainage area.—773 sq mi.

Records available.—October 1930 to September 1938, October 1951 to September 1968. Monthly discharge only for some periods, published in WSP 1307.

Gage.—Digital water-stage recorder. Datum of gage is 676.31 ft above mean sea level, unadjusted (Consumers Power Co. bench mark). Oct. 1,1930 to Sept. 30, 1938, staff gage at same site at mean sea level datum (unadjusted), and Oct. 19, 1951 to May 15, 1968, graphic water stage recorder at present site and datum.

Average discharge.—25 years, 497 cfs.

Extremes.—Maximum discharge during year, 3,260 cfs Feb. 5 (gage height, 8.38 ft); minimum, 1.0 cfs May 28 (gage height 1.40 ft) (result of regulation during bridge construction); minimum daily discharge, 200 cfs May 28.
1930-38, 1951-68: Maximum discharge, 6,290 cfs May 10, 1956 (gage height, 10.79 ft); minimum, that of May 28, 1968.
Flood of Apr. 7, 1947 reached a stage of 14.4 ft, from information by powerplant operator.

Remarks.—Records good except those for the winter periods which are fair. Prior to Dec. 1, 1958, large diurnal fluctuation at low and medium flow caused by powerplant above station;occasional fluctuation since.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	409	623	404	840	1,760	370	1,040	539	845	1,900	343	251
2	415	721	400	720	2,550	365	961	493	757	2,000	319	261
3	382	773	415	640	2,890	360	909	456	707	1,960	285	232
4	335	805	380	600	3,050	350	942	456	625	1,800	311	248
5	311	831	393	560	3,210	382	942	404	545	1,570	315	257
6	311	831	426	520	3,010	420	948	398	505	1,330	329	245
7	320	825	519	500	2,690	432	955	404	442	1,150	369	245
8	279	799	565	490	2,270	468	929	387	423	955	410	245
9	320	766	597	470	1,830	513	864	382	392	768	428	248
10	279	727	623	460	1,300	571	805	393	319	674	423	267
11	330	727	805	450	1,120	604	760	371	352	550	414	296
12	350	766	1,200	440	987	617	688	345	374	510	419	339
13	345	753	1,440	440	883	578	623	340	352	466	387	378
14	350	753	1,700	430	780	571	630	371	335	414	378	378
15	335	747	1,730	430	700	565	708	355	335	378	323	347
16	393	727	1,700	430	620	578	740	420	331	365	327	311
17	420	695	1,570	440	565	623	857	420	319	339	396	292
18	426	682	1,510	440	539	662	974	426	311	331	419	327
19	444	662	1,440	445	500	714	1,030	420	311	343	442	347
20	444	623	1,380	445	480	753	1,010	415	303	331	423	335
21	426	604	1,360	430	460	766	968	415	289	323	383	374
22	387	656	1,400	410	438	766	870	404	292	311	335	361
23	376	604	1,400	395	420	766	825	371	356	303	315	361
24	306	578	1,440	376	400	766	799	376	331	456	307	410
25	311	558	1,510	380	387	792	734	335	396	475	264	396
26	315	532	1,510	380	385	909	695	315	652	466	267	387
27	345	462	1,460	387	393	1,030	682	335	1,010	470	264	428
28	409	470	1,410	487	370	1,070	623	200	1,240	428	254	356
29	450	460	1,340	760	371	1,100	610	762	1,390	410	254	343
30	493	444	1,200	1,140	------	1,090	558	779	1,720	396	241	335
31	578	------	1,050	1,370	------	1,070	------	751	------	365	232	------
TOTAL	11,594	20,204	34,277	16,705	35,358	20,621	24,679	13,238	16,559	22,537	10,586	9,600
MEAN	374	673	1,106	539	1,219	665	823	427	552	727	341	320
MAX	578	831	1,730	1,370	3,210	1,100	1,040	779	1,720	2,000	442	428
MIN	279	444	380	376	370	350	558	200	289	303	232	232
CFSM	.48	.87	1.43	.70	1.58	.86	1.06	.55	.71	.94	.44	.41
IN.	.56	.97	1.65	.80	1.70	.99	1.19	.64	.80	1.08	.51	.46

CAL YR 1967 TOTAL 248,078 MEAN 680 MAX 2,460 MIN 48 CFSM .88 IN 11.94
WTR YR 1968 TOTAL 235,958 MEAN 645 MAX 3,210 MIN 200 CFSM .83 IN 11.35

4-1185. Rogue River near Rockford, Mich.

Location.--Lat 43°05'00", long 85°35'30", in NE1/4 sec.15, T.8 N., R.11 W., on left bank at downstream side of highway bridge, 2.2 miles upstream from mouth and 3.0 miles southwest of Rockford.

Drainage area.--234 sq mi.

Records available.--February 1952 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 625.2 ft above mean sea level (levels by Blass Survey Co.). Prior to Aug. 30, 1952, wire-weight gage and Aug. 30, 1952, to Sept. 24, 1964, graphic water-stage recorder at same site and datum.

Average discharge.--16 years, 211 cfs.

Extremes.--Maximum discharge during year, 1,080 cfs Feb. 4; maximum gage height, 7.16 ft Feb. 4 (backwater from ice); minimum discharge, 50 cfs Mar. 8 (gage height, 3.64 ft); minimum daily discharge, 78 cfs Aug. 30, 31, Sept. 1.

1952-68: Maximum discharge, 2,640 cfs Mar. 31, 1960 (gage height, 8.59 ft); minimum, 28 cfs Jan. 22, 1967 (gage height, 3.41 ft); minimum daily discharge, 49 cfs Aug. 27, 1955.

Remarks.--Records good except those for winter periods, which are fair. Some diurnal fluctuation caused by mills above station.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	162	293	210	200	670	140	281	217	302	294	100	78
2	164	356	215	200	995	140	258	205	288	262	99	81
3	156	379	208	200	930	140	246	198	256	228	99	87
4	143	420	205	200	990	140	314	191	230	191	96	93
5	133	429	206	200	733	150	306	189	208	187	97	96
6	125	407	221	200	519	150	303	188	182	180	106	99
7	120	372	247	200	451	160	291	180	165	170	139	100
8	139	340	259	200	390	162	281	175	154	161	144	97
9	156	313	266	200	340	216	255	175	148	158	141	102
10	170	288	277	200	290	239	234	169	144	156	126	115
11	162	334	311	200	250	246	213	162	143	149	115	124
12	160	331	421	200	230	239	200	159	142	143	107	121
13	159	333	422	200	210	204	192	140	140	136	104	112
14	163	356	487	195	200	193	219	177	137	132	101	104
15	161	367	445	195	180	185	210	213	139	131	97	99
16	234	348	410	190	170	200	198	226	136	127	101	97
17	211	331	344	190	160	211	198	233	136	123	102	96
18	208	321	336	180	160	217	227	221	139	122	102	113
19	203	301	305	170	160	251	228	224	149	122	101	126
20	202	284	275	170	160	264	234	218	152	121	100	139
21	189	271	315	170	160	263	247	208	152	119	100	136
22	176	269	311	160	160	259	246	202	152	116	97	128
23	164	267	306	150	150	255	259	190	152	112	92	121
24	156	257	300	150	145	244	280	177	156	116	87	139
25	166	246	317	150	145	246	283	161	199	122	85	153
26	167	241	249	150	145	283	279	183	243	119	84	160
27	186	235	219	150	140	298	272	235	299	112	83	160
28	209	228	210	160	140	324	261	282	300	107	82	146
29	213	212	200	180	140	329	248	301	341	106	81	130
30	221	224	200	240	------	319	234	304	334	104	78	122
31	244	------	200	350	------	304	------	303	------	102	78	------
TOTAL	5,422	9,353	8,897	5,900	9,513	6,971	7,497	6,406	5,818	4,528	3,124	3,474
MEAN	175	312	287	190	328	225	250	207	194	146	101	116
MAX	244	429	487	350	995	329	314	304	341	294	144	160
MIN	120	212	200	150	140	140	192	140	136	102	78	78
CFSM	.75	1.33	1.23	.81	1.40	.96	1.07	.88	.83	.62	.43	.50
IN.	.86	1.49	1.41	.94	1.51	1.11	1.19	1.02	.92	.72	.50	.55

CAL YR 1967:	TOTAL	107,695	MEAN	295	MAX	1,580	MIN	109	CFSM	1.26	IN.	17.11
WTR YR 1968:	TOTAL	76,903	MEAN	210	MAX	995	MIN	78	CFSM	.90	IN.	12.22

4-1190. Grand River at Grand Rapids, Mich.

Location.--Lat 42°57'50", long 85°40'35", in NE1/4 sec.25, T.7 N., R.12 W., on right bank 500 ft upstream from bridge on Fulton Street, 1.7 miles upstream from Plaster Creek, and at mile 41.

Drainage area.--4,900 sq mi, approximately.

Records available.--March 1901 to December 1905, January 1906 to August 1918 (gage heights only), October 1930 to September 1968. Monthly discharge only for some periods, published in WSP 1307. Gage-height records collected in this vicinity since 1907 are contained in reports of U. S. Weather Bureau.

Gage.--Digital water-stage recorder. Datum of gage is 585.70 ft above mean sea level, datum of 1929 (levels by City of Grand Rapids). March 1901 to August 1918, staff gage at Fulton Street Bridge 500 ft downstream and Oct. 1, 1930, to Oct. 26, 1953, water-stage recorder at sewage pumping station 1 mile downstream at datum 2.99 ft higher. Oct. 26, 1953, to Sept. 24, 1964, graphic water-stage recorder at present site and datum.

Average discharge.--42 years, 3,378 cfs.

Extremes.--Maximum discharge during year, 20,000 cfs Feb. 6 (gage height, 15.23 ft); minimum, 1,040 cfs Sept. 6 (gage height, 2.76 ft); minimum daily, 1,360 cfs Sept. 6.

1901-5, 1930-68: Maximum discharge, 54,000 cfs Mar. 28, 1904 (gage height, 19.5 ft, from graph based on gage readings, site then in use); minimum daily, 381 cfs Aug. 9, 17, 1936.

Maximum discharge since at least 1901, that of Mar. 28, 1904.

Remarks.--Records good except those for winter periods, which are fair. Moderate diurnal fluctuation at low and medium flow caused by powerplants above station.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.710	3.180	2.550	4.100	8.920	2.400	6.790	3.300	6.600	13.500	2.740	1.390
2	1.610	3.420	2.500	3.800	13.400	2.400	6.330	3.370	6.720	14.500	2.510	1.390
3	1.640	3.640	2.440	3.500	18.000	2.300	5.980	3.700	6.120	14.900	2.530	1.380
4	1.570	4.040	2.310	3.200	19.000	2.300	6.220	3.240	5.780	14.400	2.270	1.370
5	1.520	4.170	2.390	3.000	19.500	2.400	6.480	2.990	5.220	13.000	2.240	1.370
6	1.500	4.160	2.460	2.800	19.900	2.400	6.430	2.770	4.700	11.200	2.250	1.360
7	1.430	4.170	2.530	2.700	19.100	2.400	6.240	2.790	4.330	9.670	2.330	1.400
8	1.450	3.930	2.710	2.500	17.400	2.500	6.160	2.770	3.920	8.280	2.480	1.420
9	1.540	3.790	3.050	2.400	15.000	2.600	6.090	2.750	3.490	7.230	2.330	1.500
10	1.540	3.670	3.210	2.300	10.000	2.700	5.900	3.100	3.150	6.290	2.230	1.530
11	1.610	3.800	3.310	2.200	8.600	2.800	5.540	2.680	2.650	5.800	2.090	1.720
12	1.610	4.120	5.190	2.200	7.600	2.900	5.100	2.410	2.540	5.270	2.350	1.780
13	1.520	4.140	7.780	2.200	6.800	2.900	4.860	2.430	2.360	4.570	2.530	1.760
14	1.570	4.100	8.500	2.100	5.800	3.000	4.570	2.610	2.360	4.260	2.390	1.750
15	1.690	3.970	8.830	2.100	5.000	3.100	4.430	2.630	2.190	3.930	2.340	1.680
16	1.940	3.900	8.590	2.200	4.700	3.240	4.910	2.630	2.070	3.580	2.200	1.740
17	1.970	3.760	8.020	2.200	4.600	3.430	5.220	3.010	2.020	3.340	2.190	1.980
18	2.050	3.590	7.350	2.200	4.400	3.420	5.160	3.170	1.970	3.230	2.290	1.760
19	2.070	3.510	6.790	2.300	4.000	3.470	5.110	3.150	1.970	3.040	2.320	1.450
20	2.220	3.400	6.250	2.300	3.500	4.070	4.880	2.660	1.940	2.830	2.340	1.380
21	2.220	3.410	6.230	2.400	3.300	4.200	4.900	2.880	1.910	2.660	2.110	1.460
22	2.330	3.410	6.560	2.400	3.200	4.200	4.740	2.860	1.710	2.540	1.910	1.790
23	2.160	3.300	7.300	2.500	3.100	4.410	4.560	2.770	1.730	2.360	1.860	2.080
24	2.020	3.230	7.900	2.600	3.000	4.230	4.440	2.540	2.570	2.530	1.800	1.950
25	2.020	3.110	8.040	2.600	2.900	4.360	4.380	2.390	4.490	2.620	1.710	1.970
26	1.990	3.090	7.730	2.700	2.700	4.800	4.450	2.390	5.710	2.590	1.630	2.050
27	2.070	2.980	6.850	2.800	2.600	5.410	4.230	2.540	7.320	2.560	1.590	2.030
28	2.190	2.840	5.990	3.000	2.500	6.370	4.070	3.210	8.880	2.540	1.520	1.940
29	2.360	2.630	5.250	3.200	2.500	6.890	4.080	4.250	10.600	2.670	1.470	1.940
30	2.460	2.560	4.700	4.400	------	7.030	3.640	5.750	12.300	2.760	1.430	1.860
31	2.680	------	4.500	6.000	------	6.940	------	6.090	------	2.770	1.400	------
TOTAL	58.260	107.020	167.810	86.900	241.020	115.570	156.040	95.830	129.320	181.420	65.380	50.080
MEAN	1,879	3,567	5,413	2,803	8,311	3,728	5,201	3,091	4,311	5,852	2,109	1,669
MAX	2,680	4,170	8,830	6,000	19,900	7,030	6,790	6,090	12,300	14,900	2,740	2,080
MIN	1,430	2,560	2,310	2,100	2,500	2,300	3,640	2,390	1,710	2,360	1,400	1,360
CFSM	.38	.73	1.10	.57	1.70	.76	1.06	.63	.88	1.19	.43	.34
IN.	.44	.81	1.27	.66	1.83	.88	1.18	.73	.98	1.38	.50	.38

CAL YR 1967:	TOTAL	1,457,603	MEAN	3,993	MAX	16,100	MIN	923	CFSM	.81	IN.	11.06
WTR YR 1968:	TOTAL	1,454,650	MEAN	3,974	MAX	19,900	MIN	1,360	CFSM	.81	IN.	11.04

GPO 817-436-9

STREAMS TRIBUTARY TO LAKE MICHIGAN

4-1210. Muskegon River near Merritt, Mich.

Location.--Lat 44°20'10", long 84°53'25", in NW¼NW¼ sec.2, T.22 N., R.5 W., on right bank 35 ft upstream from bridge on State Highway 55, 0.7 mile upstream from West Branch, 2.7 miles east of Merritt, 4.3 miles downstream from Reedsburg Dam, and at mile 210.8.

Drainage area.--309 sq mi.

Records available.--October 1946 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 1,117.82 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to July 13, 1949, wire-weight gage on downstream side of bridge at same datum.

Average discharge.--22 years, 221 cfs.

Extremes.--Maximum discharge during year, 399 cfs Mar. 20 (gage height, 6.32 ft); maximum gage height, 6.96 ft Feb. 11 (backwater from ice), minimum daily discharge, 100 cfs Aug. 15.
1946-68: Maximum discharge, 1,340 cfs Apr. 8, 1959 (gage height, 8.16 ft); maximum gage height, 8.25 ft July 11, 1957; minimum discharge, 26 cfs Aug. 17, 18-20, Sept. 2-5, 12-15, 1958.

Remarks.--Records good except those for the winter periods, which are fair. Occasional regulation by operation of Reedsburg Dam.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	139	181	220	210	270	210	346	232	230	342	152	130
2	134	213	220	225	300	210	332	214	226	313	138	135
3	135	233	222	235	270	210	327	215	224	291	114	150
4	135	274	222	240	265	215	322	214	212	267	110	145
5	143	272	221	220	265	215	335	207	196	255	110	142
6	148	265	224	210	255	220	327	199	186	243	105	138
7	166	260	237	220	250	220	316	192	178	224	115	134
8	156	249	260	230	240	234	277	182	186	213	125	140
9	157	244	271	230	230	236	281	186	188	212	120	146
10	161	245	271	235	205	240	293	188	217	213	115	160
11	158	249	272	235	225	235	277	181	228	199	110	171
12	150	263	305	235	230	230	248	177	231	190	110	156
13	147	268	330	235	235	220	246	179	226	180	105	149
14	158	268	300	235	235	210	258	181	201	170	105	142
15	159	267	270	230	235	230	252	190	199	160	100	139
16	176	254	240	220	220	248	230	185	191	155	105	137
17	172	276	225	240	200	273	214	188	181	160	105	135
18	170	275	225	250	210	305	226	192	175	175	115	142
19	171	272	225	250	210	354	226	192	192	190	115	148
20	148	263	240	250	210	390	225	195	188	185	112	180
21	150	257	270	245	205	370	230	193	181	175	111	195
22	147	253	306	249	205	360	236	183	188	165	108	180
23	143	249	280	243	205	340	240	181	180	160	108	170
24	143	244	260	220	205	330	232	181	181	150	111	175
25	132	243	240	210	200	329	258	171	246	150	119	190
26	148	240	230	225	205	329	265	166	273	145	128	175
27	158	235	205	227	210	321	264	180	335	145	128	170
28	156	230	220	233	210	307	255	210	353	145	128	168
29	148	225	230	236	210	334	244	234	356	145	129	163
30	153	220	230	246	------	342	241	240	356	145	129	157
31	175	------	215	244	------	343	------	238	------	143	130	------
TOTAL	4,736	7,487	7,686	7,213	6,615	8,610	8,023	6,066	6,704	6,005	3,615	4,662
MEAN	153	250	248	233	228	278	267	196	223	194	117	155
MAX	176	276	330	250	300	390	346	240	356	342	152	195
MIN	132	181	205	210	200	210	214	166	175	143	100	130
CFSM	.495	.809	.803	.754	.738	.900	.864	.634	.722	.628	.379	.502
IN	.57	.90	.93	.87	.80	1.04	.97	.73	.81	.72	.44	.56

CAL YR 1967	TOTAL 112,508	MEAN 308	MAX 868	MIN 91	CFSM .997	IN 13.54
WTR YR 1968	TOTAL 77,422	MEAN 212	MAX 390	MIN 100	CFSM .686	IN 9.32

4-1213. Clam River at Vogel Center, Mich.

Location.--Lat 44°12'02", long 85°03'10", in SW¼NW¼ sec.21, T.21 N., R.6 W., on left bank 10 ft downstream from bridge on county road, 0.5 mile north of Vogel Center, and 3.5 miles southwest of Falmouth.

Drainage area.--243 sq mi.

Records available.--June 1966 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 1,130 ft (from topographic map).

Extremes.--Maximum discharge during year, 310 cfs Mar. 20 (gage height, 3.90 ft); minimum, 52 cfs June 10.
1966-68: Maximum discharge, 713 cfs Dec. 10, 1966 (gage height, 5.41 ft); minimum, 29 cfs Nov. 3, 1966, result of freezeup.

Remarks.--Records good except those for the winter periods, which are fair. Some regulation by dams above station.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	83	134	115	95	212	95	176	91	115	190	58	58
2	81	166	110	95	284	85	158	81	110	157	58	65
3	81	185	113	95	250	90	157	75	101	140	56	72
4	79	182	113	95	180	95	161	73	87	130	56	62
5	77	164	113	95	170	98	162	71	81	121	58	65
6	71	151	115	95	160	96	147	70	71	115	60	69
7	68	136	126	92	150	96	128	67	68	110	65	68
8	71	130	159	90	145	107	115	67	71	101	70	69
9	75	126	164	92	130	149	106	71	71	97	63	73
10	79	126	151	95	120	172	101	68	68	92	61	74
11	85	142	145	96	110	170	95	68	70	77	61	85
12	85	157	187	98	110	150	89	70	70	70	60	80
13	85	159	250	100	110	140	87	70	70	67	59	69
14	85	151	210	100	110	130	102	70	68	67	57	63
15	85	142	170	98	115	138	102	74	63	68	56	60
16	96	128	150	98	115	162	99	77	62	68	59	57
17	104	134	150	100	110	208	91	75	61	68	62	56
18	100	138	149	106	105	246	89	74	66	86	60	67
19	96	145	149	109	105	292	89	77	80	97	70	76
20	96	144	147	115	100	304	89	81	80	84	66	89
21	88	132	151	115	100	254	97	83	74	73	65	84
22	83	128	160	111	100	204	101	77	74	66	64	72
23	79	126	150	105	95	168	99	73	75	63	62	71
24	77	128	135	95	95	155	110	71	73	68	62	84
25	81	140	125	90	95	153	115	74	140	70	60	137
26	85	170	120	95	92	174	126	71	191	66	60	118
27	88	150	115	100	92	195	126	92	236	67	65	89
28	92	125	110	104	96	202	104	170	266	73	58	91
29	96	120	105	124	95	206	86	215	262	65	55	95
30	100	115	105	142	------	191	86	180	230	60	55	95
31	113	------	100	144	------	176	------	140	------	60	55	------
TOTAL	2,664	4,274	4,362	3,184	3,751	5,101	3,403	2,716	3,154	2,736	1,876	2,313
MEAN	85.9	142	141	103	129	165	113	87.6	105	88.3	60.5	77.1
MAX	113	185	250	144	284	304	176	215	266	190	70	137
MIN	68	115	100	90	92	85	86	67	61	60	55	56
CFSM	.353	.584	.580	.424	.531	.679	.465	.360	.432	.363	.249	.317
IN	.41	.65	.67	.49	.57	.78	.52	.42	.48	.42	.29	.35

CAL YR 1967	TOTAL 52,112	MEAN 143	MAX 569	MIN 56	CFSM .588	IN 7.98
WTR YR 1968	TOTAL 39,534	MEAN 108	MAX 304	MIN 55	CFSM .444	IN 6.05

PEAK DISCHARGE (BASE, 300 CFS)

DATE	TIME	G.HT.	DISCHARGE
02-02	1000	3.89	308
03-20	0600	3.90	310

STREAMS TRIBUTARY TO LAKE MICHIGAN

4-1215. Muskegon River at Evart, Mich.

Location.--Lat 43°53'55", long 85°15'20", in NW¼NE¼ sec.3, T.17 N., R.8 W., on right bank 500 ft downstream from bridge on U. S. Highway 10 at Evart, 0.4 mile upstream from Twin Creek, and at mile 123.9.

Drainage area.--1,450 sq mi, approximately.

Records available.--October 1930 to September 1931, October 1933 to September 1968. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Water-stage recorder. Datum of gage is 977.72 ft above mean sea level, datum of 1929. Prior to Apr. 12, 1934, chain gage at site 500 ft upstream, Apr. 12, 1934, to May 22, 1935, chain gage at site 400 ft upstream, and May 23, 1935, to Nov. 7, 1956, wire-weight gage at site 500 ft upstream at present datum.

Average discharge.--36 years, 953 cfs.

Extremes.--Maximum discharge during year, 2,520 cfs June 29 (gage height, 9.48 ft); maximum gage height, 10.81 ft Jan. 4 (backwater from ice); minimum discharge, 435 cfs Aug. 26, 27.
1930-31, 1933-68: Maximum discharge, 7,750 cfs Apr. 9, 1959 (gage height, 14.42 ft); minimum observed, 164 cfs Dec. 20, 1947, result of freeze-up.

Remarks.--Records good except those for the winter periods, which are fair. Records of water temperatures for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	612	844	900	700	1.410	720	1.750	978	1.410	2.170	565	455
2	600	1.110	900	700	1.950	700	1.690	935	1.340	1.960	550	485
3	594	1.230	900	700	1.800	700	1.650	900	1.230	1.830	540	505
4	576	1.310	880	700	1.600	700	1.670	872	1.130	1.710	530	495
5	555	1.290	879	700	1.300	700	1.670	830	1.030	1.560	515	505
6	535	1.230	893	700	1.200	720	1.590	802	935	1.400	505	510
7	520	1.160	1.000	700	1.150	720	1.510	781	851	1.190	525	500
8	535	1.120	1.200	700	1.100	753	1.430	753	823	1.000	565	505
9	560	1.090	1.270	700	1.050	1.020	1.370	725	886	1.040	550	510
10	594	1.090	1.220	720	1.000	1.310	1.310	704	865	1.110	535	560
11	600	1.200	1.230	740	850	1.100	1.230	678	865	942	510	612
12	606	1.270	1.550	740	850	950	1.150	672	914	851	500	606
13	612	1.250	1.830	740	800	850	1.100	678	907	788	495	588
14	630	1.240	1.500	740	800	800	1.090	678	872	718	485	565
15	630	1.190	1.200	740	800	950	1.090	760	830	678	475	535
16	732	1.140	1.050	700	800	1.050	1.050	753	767	648	480	515
17	753	1.110	1.000	740	800	1.300	1.030	774	704	624	500	505
18	732	1.150	1.000	760	800	1.500	1.030	753	678	654	525	515
19	711	1.170	1.000	760	750	1.740	1.010	774	725	732	525	588
20	684	1.150	1.000	760	720	2.010	986	886	732	753	525	660
21	672	1.110	1.100	760	720	2.030	1.070	858	718	739	510	690
22	660	1.090	1.390	760	700	1.930	1.110	851	739	704	500	654
23	630	1.070	1.280	730	700	1.770	1.080	837	718	654	485	630
24	624	1.030	1.100	680	700	1.640	1.130	802	746	624	465	636
25	636	1.020	1.000	720	700	1.630	1.180	739	914	606	440	725
26	630	1.070	860	720	690	1.680	1.180	725	1.370	588	435	760
27	642	1.130	820	739	684	1.750	1.150	1.030	2.070	582	435	746
28	660	1.070	760	760	690	1.770	1.110	1.600	2.320	594	445	697
29	678	920	700	823	710	1.790	1.080	1.770	2.450	576	450	672
30	704	920	670	1.000	------	1.750	1.030	1.750	2.420	576	450	660
31	781	------	700	1.100	------	1.740	------	1.590	------	570	450	------
TOTAL	19.688	33.774	32.782	23.232	27.824	39.773	37.526	28.238	32.959	29.171	15.465	17.589
MEAN	635	1,126	1,057	749	959	1,283	1,251	911	1,099	941	499	586
MAX	781	1,310	1,830	1,100	1,950	2,030	1,750	1,770	2,450	2,170	565	760
MIN	520	844	670	680	684	700	986	672	678	570	435	455
CFSM	.438	.777	.729	.517	.661	.885	.863	.628	.758	.649	.344	.404
IN	.50	.87	.84	.60	.71	1.02	.96	.72	.85	.75	.40	.45

CAL YR 1967	TOTAL 458,445	MEAN 1,256	MAX 4,770	MIN 445	CFSM .866	IN 11.76
WTR YR 1968	TOTAL 338,021	MEAN 924	MAX 2,450	MIN 435	CFSM .637	IN 8.67

4-1219. Little Muskegon River near Morley, Mich.

Location.--Lat 43°30'09", long 85°20'33", in SW¼SW¼ sec.24, T.13 N., R.9 W., on right bank at upstream side of highway bridge on 130th Avenue, 0.5 miles downstream from Rustford Dam, and 5.2 miles east of Morley.

Drainage area.--138 sq mi.

Records available.--October 1966 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 920 ft (from topographic map).

Extremes.--Maximum discharge during year, 428 cfs Feb. 2 (gage height, 3.59 ft); minimum, 52 cfs Sept. 1.
1966-68: Maximum discharge, 698 cfs Dec. 8, 1966 (gage height, 4.73 ft); minimum daily, 50 cfs Oct. 1-12, 1966.

Remarks.--Records good except those for the winter periods, which are fair. Occasional regulation from Rustford Dam. Record of water temperature for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	94	158	114	95	250	92	154	104	210	152	64	54
2	84	226	114	95	402	90	132	100	214	130	64	64
3	80	222	114	95	300	90	130	96	184	118	62	72
4	80	210	114	95	230	90	178	96	162	108	62	64
5	78	180	114	95	190	90	192	96	136	100	62	66
6	76	162	134	95	170	90	158	94	120	96	66	66
7	88	150	176	90	168	92	132	92	110	90	70	64
8	104	136	190	90	156	100	132	90	110	86	77	62
9	124	130	166	90	142	136	134	92	100	94	72	64
10	126	134	148	95	145	154	122	94	96	90	68	76
11	114	172	156	97	130	136	118	94	94	76	66	74
12	106	192	263	105	130	124	108	90	90	70	64	68
13	104	180	274	105	120	115	116	88	88	68	64	64
14	114	178	236	105	120	104	118	96	86	66	64	64
15	112	174	170	100	120	102	126	144	84	64	64	62
16	150	160	150	100	115	116	116	124	80	64	64	62
17	150	152	144	105	115	136	114	120	80	64	70	64
18	130	158	150	105	120	142	136	106	82	78	68	72
19	118	164	152	105	115	164	130	140	92	86	76	78
20	108	152	144	105	110	182	124	144	86	74	74	84
21	102	144	178	110	110	166	142	142	84	70	66	78
22	98	140	185	104	105	144	134	124	86	68	64	74
23	94	140	160	104	105	126	134	110	80	66	62	70
24	94	134	140	95	105	124	156	102	86	66	60	94
25	106	134	130	95	105	134	154	94	90	66	58	108
26	104	138	120	98	100	180	144	114	124	62	58	86
27	104	134	115	102	95	202	126	241	232	70	62	80
28	120	120	110	106	95	194	114	351	210	76	56	78
29	124	115	105	128	95	184	108	362	184	66	54	76
30	132	120	95	188	------	164	106	316	178	66	54	84
31	150	------	95	164	------	156	------	246	------	64	54	------
TOTAL	3,368	4,709	4,656	3,261	4,263	4,119	3,988	4,302	3,658	2,514	1,989	2,172
MEAN	109	157	150	105	147	133	133	139	122	81.1	64.2	72.4
MAX	150	226	274	188	402	202	192	362	232	152	77	108
MIN	76	115	95	90	95	90	106	88	80	62	54	54
CFSM	.790	1.14	1.09	.761	1.07	.964	.964	1.01	.884	.588	.465	.525
IN	.91	1.27	1.25	.88	1.15	1.11	1.07	1.16	.99	.68	.54	.59

CAL YR 1967	TOTAL 53,549	MEAN 147	MAX 520	MIN 53	CFSM 1.07	IN 14.43
WTR YR 1968	TOTAL 42,999	MEAN 117	MAX 402	MIN 54	CFSM .848	IN 11.59

STREAMS TRIBUTARY TO LAKE MICHIGAN

4-1220. Muskegon River at Newaygo, Mich.

Location.--Lat 43°25'20", long 85°48'05", in NE¼NE¼ sec.24, T.12 N., R.13 W., on left bank in tailrace of nonoperative powerplant at Newaygo, 600 ft downstream from Penoyer Creek and at mile 39.1.

Drainage area.--2,350 sq mi, approximately.

Records available.--July to December 1908, July 1909 to July 1915, January 1916 to December 1919, October 1930 to September 1968. Monthly discharge only for some periods, published in WSP 1307. Records for June 1901 to December 1906, published in WSP 129, 170, and 206, have been found to be unreliable and should not be used.

Gage.--Digital water-stage recorder. Datum of gage is 625.83 ft above mean sea level, datum of 1929. October 1930 to January 1939 staff gage, and January 31, 1939, to September 30, 1963, graphic water-stage recorder at present site, at datum 40.0 ft lower. October 1, 1963, to August 19, 1964, graphic water-stage recorder at same site and datum.

Average discharge.--46 years (1909-14, 1916-19, 1930-68), 1,908 cfs.

Extremes.--Maximum discharge during year, 5,130 cfs June 28 (gage height, 9.72 ft); maximum gage height, 11.22 ft Jan. 12 (backwater from ice); minimum discharge, 830 cfs Oct. 13 (gage height, 6.53 ft); minimum daily discharge, 914 cfs Aug. 10, 11. 1908-19, 1930-68: Maximum daily discharge, 14,950 cfs Mar. 25, 1913; minimum, 52 cfs Oct. 2, 1965 (gage height, 5.31 ft), result of regulation during pipeline repair; minimum daily, 330 cfs Feb. 15, 1914.

Remarks.--Records good. Flow regulated by powerplants above station, the largest of which are at Croton Dam, Hardy Dam (since 1931), and Rogers Dam. Since Dec. 27, 1965 powerplant at Newaygo nonoperative.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1,080	2,360	2,220	1,060	3,710	2,030	2,760	1,500	3,540	3,840	1,200	1,000
2	1,390	2,820	1,740	2,410	4,700	1,340	3,030	1,230	3,530	2,830	1,170	1,010
3	1,860	3,550	1,390	2,000	4,730	1,340	3,030	1,230	3,320	2,090	979	1,000
4	1,880	3,390	1,600	2,000	3,820	1,560	2,840	1,220	2,800	1,250	980	970
5	1,790	2,380	2,380	1,800	3,840	2,160	2,170	1,220	2,160	1,450	987	981
6	1,080	2,690	3,060	1,100	3,850	2,670	1,730	1,410	1,740	1,740	1,110	972
7	1,070	3,130	2,610	1,100	3,840	2,900	1,730	1,700	1,430	1,740	1,320	917
8	1,070	2,800	1,930	2,200	3,830	2,900	1,730	1,700	1,020	2,320	1,660	1,030
9	1,420	2,350	1,920	1,400	3,640	3,170	1,720	1,700	1,020	2,660	1,350	1,080
10	1,880	2,190	1,620	1,100	3,040	3,680	1,920	1,460	1,340	2,160	914	1,130
11	1,740	1,770	1,800	1,800	2,200	3,720	2,070	1,020	1,750	2,140	914	1,120
12	972	1,410	3,200	2,100	1,900	3,730	1,500	1,020	1,760	1,860	1,020	1,180
13	955	2,160	3,850	2,200	2,200	3,640	1,230	1,120	1,750	1,010	1,270	1,610
14	1,030	3,560	3,840	2,200	2,300	2,650	1,240	1,290	1,560	1,000	1,350	1,050
15	1,020	3,350	3,750	2,220	2,300	2,280	1,410	1,470	1,040	1,280	958	1,040
16	1,650	3,240	3,110	2,240	1,850	2,280	1,680	1,730	1,030	1,550	938	1,290
17	2,520	2,430	1,950	2,240	1,330	2,290	1,680	1,710	1,330	1,320	933	1,690
18	2,440	1,430	2,650	2,250	1,410	2,280	1,680	1,700	1,760	1,260	933	1,430
19	1,920	1,410	3,520	2,250	1,580	2,660	1,670	1,720	1,750	1,240	967	1,460
20	1,770	2,080	3,530	2,240	1,900	3,490	1,680	1,900	1,460	1,190	1,090	1,050
21	1,070	3,100	3,550	2,240	1,910	3,750	1,680	2,140	1,060	1,010	1,290	1,040
22	1,070	3,060	3,540	2,240	1,890	3,610	1,470	2,130	1,050	1,300	1,480	1,040
23	1,410	1,970	2,670	2,250	1,860	3,260	1,230	1,960	1,050	1,720	1,260	1,290
24	1,870	2,440	1,940	2,230	1,840	3,020	1,370	1,510	1,560	1,620	969	1,740
25	1,890	2,630	1,650	2,230	1,900	3,020	1,940	1,230	2,550	1,230	986	1,700
26	1,870	1,950	1,810	2,090	1,950	3,040	2,280	1,250	3,330	1,120	975	1,680
27	1,890	2,110	2,500	1,860	1,920	3,030	1,720	1,570	4,550	963	979	1,510
28	1,690	2,340	2,470	1,870	1,880	3,030	1,720	3,400	5,030	951	975	1,140
29	1,360	2,340	2,080	2,220	2,040	2,840	1,720	3,830	4,640	1,220	980	983
30	1,570	2,430	1,300	3,010	------	2,540	1,720	3,870	4,600	1,540	992	1,030
31	2,050	------	1,020	3,120	------	2,550	------	3,830	------	1,220	989	------
TOTAL	48,277	74,870	76,200	63,270	75,160	86,460	55,350	55,770	66,510	49,824	33,918	36,163
MEAN	1,557	2,496	2,458	2,041	2,592	2,789	1,845	1,799	2,217	1,607	1,094	1,205
MAX	2,520	3,560	3,850	3,120	4,730	3,750	3,030	3,870	5,030	3,840	1,660	1,740
MIN	955	1,410	1,020	1,060	1,330	1,340	1,230	1,020	1,020	951	914	917
CFSM	.66	1.06	1.05	.87	1.10	1.19	.79	.77	.94	.68	.47	.51
IN.	.76	1.18	1.21	1.00	1.19	1.37	.88	.88	1.05	.79	.54	.57

CAL YR 1967 TOTAL 950,367 MEAN 2,604 MAX 6,680 MIN 955 CFSM 1.11 IN 15.04
WTR YR 1968 TOTAL 721,772 MEAN 1,972 MAX 5,030 MIN 914 CFSM .84 IN 11.42

4-1221. Bear Creek near Muskegon, Mich.

Location.--Lat 43°17'19", long 86°13'22", in NW¼ sec.4, T.10 N., R.16 W., on left bank at upstream side of bridge on North Getty Street, 1.5 miles upstream from Little Bear Creek, and 3.9 miles northeast of Muskegon.

Drainage area.--14.8 sq mi.

Records available.--October 1965 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 610 ft (from topographic map).

Extremes.--Maximum discharge during year, 193 cfs Feb. 1 (gage height, 7.92 ft); minimum daily, 3.8 cfs Aug. 29, 30.
1965-68: Maximum discharge, 274 cfs Feb. 10, 1966 (gage height, 8.43 ft); minimum, 3.7 cfs Oct. 4, 1966.

Remarks.--Records good except those below 6 cfs, which are poor. Some regulation above station.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.6	26	12	13	116	12	17	11	19	10	6.2	4.5
2	6.1	40	13	13	126	12	15	10	26	8.3	5.5	5.4
3	5.5	29	14	13	60	12	14	10	18	7.6	5.5	5.0
4	5.2	29	14	13	45	12	23	10	14	7.0	5.5	4.7
5	5.0	24	14	13	34	12	18	10	12	8.1	6.0	4.6
6	4.8	22	17	12	29	14	15	9.3	11	7.2	7.0	4.6
7	4.8	19	22	12	30	16	14	9.2	9.8	6.4	9.3	4.5
8	5.9	20	23	12	29	19	13	9.0	9.2	6.2	7.0	4.5
9	7.2	20	18	12	25	26	12	8.6	8.5	6.5	6.5	4.5
10	9.9	17	17	12	23	32	12	8.1	8.1	6.2	6.0	4.5
11	8.2	41	22	12	21	26	11	8.1	7.5	5.9	5.5	4.5
12	8.2	46	40	12	21	20	11	8.0	7.3	5.8	5.5	4.7
13	9.2	29	34	13	20	16	10	7.5	7.2	5.6	5.5	5.0
14	10	25	22	13	18	13	11	13	7.5	5.4	5.5	4.7
15	9.0	26	18	13	18	16	11	14	7.0	5.2	5.2	4.6
16	16	21	16	12	18	19	10	14	6.4	5.2	5.0	5.0
17	12	21	16	12	17	20	12	15	6.2	5.6	5.0	4.8
18	10	23	19	13	17	19	21	12	7.6	12	5.0	5.0
19	10	23	18	14	17	22	17	15	8.1	9.5	5.0	5.5
20	9.3	19	16	15	17	24	15	14	6.8	7.3	5.0	6.5
21	8.8	18	20	16	17	20	18	12	8.5	6.5	4.7	6.0
22	8.2	18	25	18	16	18	15	10	7.8	6.0	4.5	5.5
23	8.1	18	20	17	15	17	14	9.3	7.0	5.9	4.5	7.0
24	8.7	16	18	16	15	18	17	8.8	7.2	6.7	4.2	9.4
25	17	16	17	15	14	20	20	7.8	7.5	5.9	4.2	6.6
26	13	18	16	15	14	20	18	12	12	5.5	4.1	5.4
27	14	16	15	14	13	19	15	19	15	5.9	4.0	5.2
28	16	14	14	17	12	17	13	26	13	5.8	3.9	5.0
29	13	13	14	35	12	16	12	29	14	5.5	3.8	5.0
30	16	12	13	92	------	14	12	22	14	5.2	3.8	5.0
31	26	------	13	56	------	16	------	17	------	5.2	3.9	------
TOTAL	311.7	679	570	565	829	557	436	388.7	313.2	205.1	162.3	157.2
MEAN	10.1	22.6	18.4	18.2	28.6	18.0	14.5	12.5	10.4	6.62	5.24	5.24
MAX	26	46	40	92	126	32	23	29	26	12	9.3	9.4
MIN	4.8	12	12	12	12	12	10	7.5	6.2	5.2	3.8	4.5
CFSM	.682	1.53	1.24	1.23	1.93	1.22	.980	.845	.703	.447	.354	.354
IN	.78	1.71	1.43	1.42	2.08	1.40	1.10	.98	.79	.52	.41	.40

CAL YR 1967	TOTAL 6,340.6	MEAN 17.4	MAX 152	MIN 4.0	CFSM 1.18	IN 15.93
WTR YR 1968	TOTAL 5,174.2	MEAN 14.1	MAX 126	MIN 3.8	CFSM .953	IN 13.00

PEAK DISCHARGE (BASE, 100 CFS)

DATE	TIME	G.HT.	DISCHARGE
01-30	0330	7.17	119
02-01	1730	7.92	193

STREAMS TRIBUTARY TO LAKE MICHIGAN

4-1222. White River near Whitehall, Mich.

Location.--Lat 43°27'50", long 86°13'55", in SE¼NW¼ sec.4, T.12 N., R.16 W., on right bank 30 ft downstream from bridge on Fruitvale Road, 6.3 miles downstream from North Branch, and 6.9 miles northeast of Whitehall.

Drainage area.--380 sq mi, approximately.

Records available.--August 1957 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 594.1 ft above mean sea level, unadjusted. Nov. 18, 1957, to Oct. 22, 1958, wire-weight gage at same site and datum.

Average discharge.--11 years, 391 cfs.

Extremes.--Maximum discharge during year, 1,300 cfs Feb. 3 (gage height, 5.88 ft); minimum, 210 cfs Aug. 29.
1957-68: Maximum discharge, 3,740 cfs Apr. 17, 1967 (gage height, 6.76 ft); minimum, 163 cfs Aug. 18, 19, 1958.

Remarks.--Records good except those for the winter periods, which are fair. Some regulation from dams above station.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	364	476	416	450	850	450	477	403	556	361	243	213
2	354	535	406	450	1,000	450	475	377	540	324	240	233
3	318	601	404	450	1,100	450	468	367	524	299	236	254
4	299	648	402	450	1,000	450	470	351	490	289	231	237
5	298	637	402	420	900	450	483	351	455	287	232	237
6	280	610	412	440	800	450	477	347	419	279	235	236
7	281	580	434	450	700	460	464	340	391	267	257	232
8	293	545	470	450	650	460	437	334	361	266	267	231
9	314	505	510	450	600	472	413	324	342	262	259	235
10	340	485	510	450	550	526	397	321	312	260	252	248
11	354	498	500	450	520	545	385	316	308	260	237	259
12	346	555	518	450	500	500	375	312	312	257	236	252
13	342	625	583	450	500	450	365	307	308	253	233	242
14	356	610	656	460	500	410	361	321	303	247	231	234
15	372	586	610	470	500	420	369	359	300	244	227	230
16	390	570	572	480	500	475	371	395	292	240	228	226
17	412	548	522	480	500	533	365	419	285	239	230	224
18	416	530	478	480	480	570	401	442	289	260	226	228
19	398	528	460	480	460	592	446	433	316	288	224	237
20	376	542	456	480	450	610	442	444	318	289	223	263
21	356	530	462	470	450	618	433	435	310	282	221	282
22	340	510	505	460	450	590	444	409	316	260	221	262
23	330	488	604	450	450	554	429	383	301	246	219	250
24	326	470	595	410	450	517	429	365	295	247	216	287
25	368	458	530	380	450	494	457	349	295	247	212	323
26	408	458	500	430	450	506	494	346	303	240	214	326
27	422	462	470	470	450	517	494	407	371	241	215	300
28	416	460	460	530	450	529	464	494	417	260	216	270
29	408	430	450	580	450	531	431	568	417	262	212	260
30	408	420	450	650	------	515	409	592	391	252	212	256
31	432	------	450	750	------	488	------	570	------	246	212	------
TOTAL	11,117	15,900	15,197	14,720	17,110	15,582	12,925	12,181	10,837	8,254	7,117	7,567
MEAN	359	530	490	475	590	503	431	393	361	266	230	252
MAX	432	648	656	750	1,100	618	494	592	556	361	267	326
MIN	280	420	402	380	450	410	361	307	285	239	212	213
CFSM	.945	1.39	1.29	1.25	1.55	1.32	1.13	1.03	.950	.700	.605	.663
IN	1.09	1.56	1.49	1.44	1.67	1.52	1.26	1.19	1.06	.81	.70	.74

CAL YR 1967	TOTAL 186,256	MEAN 510	MAX 3,140	MIN 240	CFSM 1.34	IN 18.23
WTR YR 1968	TOTAL 148,507	MEAN 406	MAX 1,100	MIN 212	CFSM 1.07	IN 14.53

4-1225. Pere Marquette River at Scottville, Mich.

Location.--Lat 43°56'40", long 86°16'45", in NW¼ sec.19, T.18 N., R.16 W., on right bank 20 ft upstream from highway bridge at south edge of Scottville and 5 3/4 miles downstream from South Branch.

Drainage area.--709 sq mi.

Records available.--August 1939 to September 1968. Published as "at Custer" prior to October 1942.

Gage.--Water-stage recorder. Datum of gage is 597.66 ft above mean sea level, datum of 1929. Prior to June 12, 1943, wire-weight gage at bridge 4 3/4 miles upstream at different datum.

Average discharge.--29 years, 623 cfs.

Extremes.--Maximum discharge during year, 1,660 cfs Feb. 4 (gage height, 4.77 ft); maximum gage height, 5.43 ft Feb. 10 (backwater from ice); minimum discharge, 389 cfs Sept. 1.

1939-68: Maximum discharge, 2,740 cfs Apr. 4, 1959 (gage height, 5.84 ft); minimum, 209 cfs Dec. 11, 1962 (discharge measurement); minimum daily, 310 cfs Aug. 9, 10, 1941 (site and datum then in use).

Remarks.--Records good except those for the winter periods, which are fair. Some regulation above station.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	605	720	730	650	1.090	700	842	678	920	804	485	394
2	605	825	720	600	1.290	700	832	660	853	717	475	441
3	582	884	711	630	1.590	700	825	639	800	651	460	475
4	565	958	705	630	1.450	700	814	625	766	608	451	478
5	550	1.010	699	630	1.400	700	804	622	708	585	449	475
6	538	994	696	600	1.300	700	804	618	657	562	462	453
7	530	942	711	600	1.270	700	790	608	620	542	498	443
8	538	895	744	600	1.170	724	758	598	598	532	502	441
9	558	842	797	600	1.050	794	727	588	575	522	508	441
10	602	804	828	600	900	864	702	580	562	532	485	475
11	618	814	828	610	800	902	684	575	560	568	468	500
12	615	850	832	630	750	926	666	562	565	540	455	508
13	612	902	874	640	750	850	651	560	575	515	447	472
14	612	958	954	660	750	780	645	562	568	500	441	445
15	610	950	1.000	680	750	818	645	600	550	485	435	429
16	630	938	962	700	750	850	651	648	538	475	435	419
17	645	916	892	700	730	912	654	699	525	468	439	413
18	678	895	828	700	700	1.000	663	720	530	502	447	413
19	672	881	790	700	680	1.080	672	752	550	542	455	431
20	648	898	776	700	680	1.120	684	744	575	560	443	475
21	625	930	783	700	650	1.140	690	738	580	542	437	480
22	612	930	814	700	650	1.110	696	744	560	502	429	460
23	602	888	898	680	660	1.040	705	711	560	480	421	447
24	598	853	954	650	670	966	708	666	575	475	411	520
25	628	825	920	600	670	912	738	636	585	465	405	595
26	642	814	850	650	680	892	794	625	645	455	403	592
27	666	804	800	700	700	888	818	660	727	470	403	595
28	669	808	750	730	700	895	797	741	786	500	401	542
29	666	790	700	770	700	892	744	828	839	525	399	495
30	669	752	650	836	------	884	708	902	853	505	395	472
31	690	------	650	902	------	870	------	938	------	498	392	------
TOTAL	19,080	26,270	24,846	20,778	25,930	27,009	21,911	20,827	19,305	16,627	13,736	14,219
MEAN	615	876	801	670	894	871	730	672	644	536	443	474
MAX	690	1,010	1,000	902	1,590	1,140	842	938	920	804	508	595
MIN	530	720	650	600	650	700	645	560	525	455	392	394
CFSM	.867	1.24	1.13	.945	1.26	1.23	1.03	.948	.908	.756	.625	.669
IN	1.00	1.38	1.30	1.09	1.36	1.42	1.15	1.09	1.01	.87	.72	.75

CAL YR 1967	TOTAL 305,395	MEAN 837	MAX 2,160	MIN 470	CFSM 1.18	IN 16.02
WTR YR 1968	TOTAL 250,538	MEAN 685	MAX 1,590	MIN 392	CFSM .966	IN 13.14

4-1230. Big Sable River near Freesoil, Mich.

Location.--Lat 44°07'15", long 86°16'50", in NE¼NE¼ sec.24, T.20 N., R.17 W., near center of span on downstream side of bridge on U. S. Highway 31, 3.4 miles northwest of Freesoil, and 7 miles upstream from Hamlin Lake.

Drainage area.--127 sq mi.

Records available.--May 1942 to September 1968. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Wire-weight gage read once daily. Datum of gage is 615.32 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Sept. 15, 1959, staff gage at site 30 ft downstream at same datum.

Average discharge.--26 years, 139 cfs.

Extremes.--Maximum discharge during year, 309 cfs Mar. 20 (gage height, 2.73 ft); maximum gage height, 3.07 ft Feb. 13 (backwater from ice); minimum discharge, 101 cfs Aug. 31.
1942-68: Maximum discharge, 555 cfs Apr. 7, 1959 (gage height, 3.4 ft from floodmarks); minimum, 65 cfs Dec. 11, 1962 (discharge measurement); minimum daily, 81 cfs Aug. 14, 1944.

Remarks.--Records good.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	125	147	145	130	223	140	182	140	161	156	113	110
2	125	156	144	120	223	135	176	140	155	146	109	120
3	120	166	140	135	209	135	175	136	153	137	108	134
4	114	173	138	135	210	135	183	135	145	135	105	134
5	114	180	138	130	232	141	180	135	141	132	107	131
6	112	175	142	130	233	140	176	134	136	131	109	131
7	112	170	147	130	220	140	170	134	131	130	124	124
8	115	162	149	130	195	143	163	136	130	132	128	120
9	116	159	150	130	180	152	157	133	125	143	124	120
10	115	161	150	130	160	150	152	128	124	132	117	127
11	118	166	152	130	165	153	152	127	126	125	115	126
12	120	165	157	130	160	165	149	125	132	122	110	123
13	122	171	160	135	160	150	145	123	130	119	108	120
14	127	179	161	135	165	149	145	131	126	115	108	117
15	130	177	159	135	165	159	149	132	124	116	106	115
16	129	175	154	135	160	179	149	134	120	111	106	116
17	129	176	150	137	150	200	150	147	119	113	107	113
18	129	175	146	137	150	240	152	151	124	122	110	113
19	131	170	146	142	150	282	151	155	131	128	115	115
20	130	173	147	147	150	304	149	155	130	127	115	125
21	125	171	153	150	145	298	145	153	128	120	111	122
22	125	167	161	150	150	264	149	147	124	115	108	120
23	120	165	160	140	150	233	155	142	125	113	106	125
24	121	161	155	134	150	215	163	136	128	111	106	127
25	133	160	150	140	145	201	167	130	132	111	105	138
26	137	160	145	150	150	199	168	140	159	110	105	144
27	139	160	140	150	140	201	161	153	173	112	105	142
28	139	155	140	150	142	203	155	162	175	115	104	138
29	135	151	140	159	144	195	147	167	176	113	104	132
30	139	150	135	170	------	192	145	170	162	110	103	128
31	144	------	135	187	------	185	------	167	------	112	102	------
TOTAL	3,890	4,976	4,589	4,343	4,976	5,778	4,760	4,398	4,145	3,814	3,403	3,750
MEAN	125	166	148	140	172	186	159	142	138	123	110	125
MAX	144	180	161	187	233	304	183	170	176	156	128	144
MIN	112	147	135	120	140	135	145	123	119	110	102	110
CFSM	.984	1.31	1.17	1.10	1.35	1.46	1.25	1.12	1.09	.969	.866	.984
IN	1.14	1.46	1.34	1.27	1.46	1.69	1.39	1.29	1.21	1.12	1.00	1.10

CAL YR 1967	TOTAL 60,291	MEAN 165	MAX 445	MIN 99	CFSM 1.30	IN 17.66
WTR YR 1968	TOTAL 52,822	MEAN 144	MAX 304	MIN 102	CFSM 1.13	IN 15.47

4-1235. Manistee River near Grayling, Mich.

Location.--Lat 44°41'35", long 84°50'50", in NW¼ sec.31, T.27 N., R.4 W., on right bank 25 ft upstream from bridge on State Highway 72, 2½ miles downstream from Goose Creek, and 6½ miles northwest of Grayling.

Drainage area.--159 sq mi.

Records available.--October 1942 to September 1968. Monthly discharge only for October 1942, published in WSP 1307.

Gage.--Water-stage recorder. Datum of gage is 1,120.64 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources).

Average discharge.--26 years, 182 cfs.

Extremes.--Maximum discharge during year, 261 cfs Nov. 12 (gage height, 1.16 ft); minimum, 131 cfs Feb. 17.
1942-68: Maximum discharge, 388 cfs Apr. 18, 1960 (gage height, 1.88 ft); maximum gage height, 2.43 ft Feb. 7, 1967 (backwater from ice); minimum discharge, 122 cfs Feb. 14, 1943, result of freeze-up.

Remarks.--Records excellent except those for the winter periods, which are good. Records of water temperatures for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	193	213	193	160	197	160	210	182	186	197	192	169
2	185	237	191	180	225	160	199	182	186	186	186	177
3	181	235	189	185	205	155	195	182	182	184	180	178
4	177	219	187	180	200	168	212	186	178	182	177	173
5	175	215	187	155	200	166	216	186	177	184	175	184
6	169	207	189	160	199	164	203	182	177	178	177	184
7	171	201	193	170	190	164	195	178	175	175	177	182
8	175	197	199	175	180	166	192	178	175	186	173	182
9	183	199	193	175	170	169	190	178	175	229	173	182
10	185	201	189	180	155	175	188	178	177	240	171	199
11	187	229	193	180	175	173	184	177	177	210	169	214
12	185	253	217	180	175	169	182	177	178	195	168	197
13	181	247	229	185	175	155	182	186	178	188	169	184
14	185	233	213	185	180	150	186	184	177	188	168	180
15	183	219	199	185	180	169	199	186	173	184	166	177
16	189	211	195	175	175	175	195	186	171	182	169	177
17	187	209	195	192	150	184	184	192	169	180	169	175
18	185	213	197	195	160	195	186	186	177	192	168	173
19	179	217	197	186	160	227	190	182	199	199	188	177
20	179	209	195	182	160	249	184	184	186	190	207	195
21	179	205	199	178	155	234	190	180	178	184	184	190
22	177	205	221	178	155	214	186	178	186	182	178	184
23	175	205	221	173	155	203	184	178	184	178	182	184
24	173	201	211	155	155	197	195	178	182	182	177	197
25	175	201	201	170	150	195	201	175	182	180	173	214
26	179	209	175	180	150	207	195	171	184	177	175	205
27	179	205	165	178	160	218	190	188	221	195	175	199
28	179	201	175	178	160	234	182	207	240	207	173	195
29	177	197	180	182	160	234	180	203	232	190	171	188
30	181	195	180	188	------	218	178	195	210	180	169	186
31	201	------	175	182	------	214	------	192	------	180	169	------
TOTAL	5,609	6,388	6,043	5,507	5,011	5,861	5,753	5,697	5,572	5,884	5,448	5,601
MEAN	181	213	195	178	173	189	192	184	186	190	176	187
MAX	201	253	229	195	225	249	216	207	240	240	207	214
MIN	169	195	165	155	150	150	178	171	169	175	166	169
CFSM	1.14	1.34	1.23	1.12	1.09	1.19	1.21	1.16	1.17	1.19	1.11	1.18
IN	1.31	1.49	1.41	1.29	1.17	1.37	1.35	1.33	1.30	1.38	1.27	1.31

CAL YR 1967	TOTAL 71,530	MEAN 196	MAX 309	MIN 155	CFSM 1.23	IN 16.73
WTR YR 1968	TOTAL 68,374	MEAN 187	MAX 253	MIN 150	CFSM 1.18	IN 15.99

4-1240. Manistee River near Sherman, Mich.

Location.--Lat 44°26'10", long 85°41'55", in NE¼NE¼ sec.36, T.24 N., R.12 W., near center span on downstream side of bridge on State Highway 37, 150 ft upstream from Wheeler Creek, 0.9 mile north of Sherman, and at mile 60.8.

Drainage area.--900 sq mi.

Records available.--July 1903 to May 1916, October 1930 to September 1931, October 1933 to September 1968. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Wire-weight gage read twice daily. Altitude of gage is 804 ft (from river-profile map). Prior to Apr. 13, 1934, chain gages at various datums. Apr. 13, 1934, to May 22, 1935, staff gage at present datum.

Average discharge.--48 years (1903-15, 1930-31, 1933-68), 1,055 cfs.

Extremes.--Maximum discharge during year, 1,680 cfs Mar. 20 (gage height, 12.87 ft); maximum gage height, 13.73 ft Dec. 27, (backwater from ice); minimum discharge, 674 cfs Sept. 1.
1903-16, 1930-31, 1933-68: Maximum discharge, 3,570 cfs Mar. 25, 1913 (gage height, 7.1 ft, from graph based on gage readings, datum then in use); minimum daily, 540 cfs Feb. 21-23, 1936.

Remarks.--Records good except those for the winter periods, which are fair.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	856	1.080	1.010	900	1.130	940	1.410	1.050	1.050	1.130	811	682
2	842	1.250	1.000	950	1.430	940	1.340	1.020	1.010	1.020	790	713
3	832	1.270	990	950	1.350	920	1.270	1.000	978	923	780	713
4	818	1.260	982	950	1.250	980	1.300	994	950	874	780	713
5	811	1.240	974	900	1.150	1.000	1.350	982	923	836	769	706
6	797	1.190	970	950	1.190	960	1.310	970	906	822	780	710
7	786	1.120	994	900	1.230	970	1.270	954	888	800	783	713
8	797	1.080	1.040	950	1.180	1.000	1.240	946	881	818	772	724
9	814	1.060	1.070	950	1.090	1.020	1.190	938	881	842	769	734
10	839	1.050	1.050	920	1.000	1.060	1.160	930	864	867	762	741
11	836	1.100	1.040	970	1.050	1.070	1.130	930	892	888	744	766
12	832	1.180	1.100	1.050	1.100	1.050	1.110	923	920	870	730	780
13	839	1.230	1.260	1.050	1.100	998	1.100	916	916	853	730	776
14	864	1.250	1.280	1.100	1.100	962	1.100	923	892	825	727	744
15	860	1.230	1.220	1.100	1.100	950	1.150	942	870	808	720	727
16	874	1.160	1.100	1.100	1.050	1.040	1.160	954	850	808	713	720
17	895	1.100	1.050	1.100	900	1.160	1.130	978	832	794	716	716
18	888	1.120	1.060	1.100	950	1.270	1.120	1.010	828	832	716	720
19	870	1.150	1.050	1.050	950	1.490	1.110	1.050	856	846	755	780
20	874	1.140	1.040	1.050	950	1.660	1.090	1.070	895	845	842	800
21	867	1.110	1.090	1.000	900	1.650	1.100	1.030	895	842	867	836
22	860	1.080	1.180	960	950	1.520	1.090	994	867	832	814	811
23	856	1.060	1.170	920	950	1.390	1.080	966	864	808	772	780
24	850	1.040	1.120	810	950	1.280	1.140	942	842	804	744	825
25	867	1.030	1.050	769	900	1.230	1.190	934	874	783	727	825
26	881	1.050	1.000	892	920	1.250	1.190	920	930	780	706	818
27	878	1.090	900	1.060	930	1.320	1.180	954	1.060	797	706	814
28	892	1.090	950	1.060	930	1.380	1.150	1.080	1.170	818	699	814
29	895	1.050	950	1.050	940	1.430	1.110	1.140	1.270	836	692	804
30	906	1.010	950	1.070	------	1.430	1.080	1.130	1.230	828	682	790
31	978	------	950	1.060	------	1.440	------	1.100	------	822	678	------
TOTAL	26.554	33.870	32.590	30.641	30.620	36.760	35.350	30.670	28.084	26.251	23.276	22.795
MEAN	857	1,129	1,051	988	1,056	1,186	1,178	989	936	847	751	760
MAX	978	1,270	1,280	1,100	1,430	1,660	1,410	1,140	1,270	1,130	867	836
MIN	786	1,010	900	769	900	920	1,080	916	828	780	678	682
CFSM	.952	1.25	1.17	1.10	1.17	1.32	1.31	1.10	1.04	.941	.834	.844
IN	1.10	1.40	1.35	1.27	1.27	1.52	1.46	1.27	1.16	1.08	.96	.94

CAL YR 1967	TOTAL 401,901	MEAN 1,101	MAX 2,350	MIN 664	CFSM 1.22	IN 16.61
WTR YR 1968	TOTAL 357,461	MEAN 977	MAX 1,660	MIN 678	CFSM 1.09	IN 14.77

4-1255. Pine River near Hoxeyville, Mich.

Location.--Lat 44°12'10", long 85°48'00", in SW¼NW¼ sec.20, T.21 N., R.12 W., on right bank 500 ft upstream from bridge on State Highway 37, 4.2 miles northwest of Hoxeyville, 8.0 miles east of Wellston, and 8 miles upstream from mouth.

Drainage area.--251 sq mi.

Records available.--July 1952 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 775 ft (by barometer).

Average discharge.--16 years, 276 cfs.

Extremes.--Maximum discharge during year, 718 cfs Feb. 2 (gage height, 4.15 ft); minimum, 198 cfs Aug. 30.
1952-68: Maximum discharge, 2,440 cfs Aug. 6, 1956 (gage height, 6.82 ft), from rating curve extended above 1,100 cfs by logarithmic plotting; minimum, 161 cfs Feb. 2, 1961.

Remarks.--Records good.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	270	337	278	238	448	250	397	280	298	337	222	204
2	250	436	272	250	682	250	364	270	302	300	218	240
3	240	475	272	250	589	252	334	265	295	272	215	278
4	232	424	270	245	400	255	358	262	275	260	210	240
5	228	379	270	240	370	255	397	262	262	248	210	235
6	225	332	275	240	360	252	367	258	255	240	215	225
7	225	308	298	240	355	252	332	252	248	232	238	215
8	232	292	343	238	346	255	318	250	248	230	252	218
9	245	285	337	238	326	302	302	248	265	228	238	222
10	260	288	315	242	278	385	298	242	260	228	228	252
11	258	361	308	252	270	388	288	242	260	225	222	258
12	252	430	418	250	270	358	282	240	265	220	215	255
13	250	388	541	250	270	300	278	238	262	218	215	232
14	262	349	445	250	270	280	280	240	260	215	212	220
15	272	324	358	250	278	290	302	255	250	215	210	212
16	280	324	318	240	275	346	310	272	248	210	212	206
17	298	302	295	250	265	427	292	285	242	210	235	204
18	282	321	295	260	250	457	292	282	250	225	255	215
19	262	352	300	265	250	514	290	272	300	275	245	232
20	258	329	298	268	245	565	285	290	280	258	240	248
21	250	305	315	265	240	502	298	280	262	232	228	232
22	248	295	457	265	245	403	308	268	255	222	220	228
23	242	290	436	265	245	346	302	262	255	218	212	220
24	242	285	376	230	245	318	361	260	265	215	208	307
25	258	282	346	240	240	324	406	248	308	212	204	397
26	272	324	300	245	250	332	379	248	415	210	204	332
27	268	352	270	252	255	367	337	278	502	225	206	280
28	268	318	260	262	258	379	310	379	577	242	204	255
29	265	292	260	280	255	397	295	412	520	232	202	240
30	265	285	260	346	------	370	285	358	409	220	200	230
31	295	------	255	349	------	358	------	318	------	220	200	------
TOTAL	7,954	10,064	10,041	7,955	9,030	10,729	9,647	8,516	9,093	7,294	6,795	7,332
MEAN	257	335	324	257	311	346	322	275	303	235	219	244
MAX	298	475	541	349	682	565	406	412	577	337	255	397
MIN	225	282	255	230	240	250	278	238	242	210	200	204
CFSM	1.02	1.33	1.29	1.02	1.24	1.38	1.28	1.10	1.21	.936	.873	.972
IN	1.18	1.49	1.49	1.18	1.34	1.59	1.43	1.26	1.35	1.08	1.01	1.09

CAL YR 1967	TOTAL 117,814	MEAN 323	MAX 936	MIN 220	CFSM 1.29	IN 17.46
WTR YR 1968	TOTAL 104,450	MEAN 285	MAX 682	MIN 200	CFSM 1.14	IN 15.48

PEAK DISCHARGE (BASE, 650 CFS)

DATE	TIME	G.HT.	DISCHARGE
02-02	1800	4.15	718

4-1260. Manistee River near Manistee, Mich.

Location.--Lat 44°16'15", long 86°11'55", in NW¼NW¼ sec.36, T.22 N., R.16 W., on right bank 6.4 miles northeast of Manistee, 6.4 miles south of Onekama, 7.8 miles upstream from Manistee Lake, and at mile 10.8.

Drainage area.--1,780 sq mi, approximately.

Records available.--October 1951 to September 1968. Monthly discharge only for October, November 1951, published in WSP 1727.

Gage.--Digital water-stage recorder. Altitude of gage is 585 ft (from river-profile map). Prior to Apr. 20, 1964, graphic water-stage recorder at same site and datum.

Average discharge.--17 years, 1,955 cfs.

Extremes.--Maximum discharge during year, 5,000 cfs Mar. 22 (gage height, 7.70 ft); maximum gage height, 8.98 ft Feb. 16 (backwater from ice); minimum daily discharge, 1,000 cfs Feb. 12.
1951-68: Maximum discharge, 6,800 cfs Apr. 9, 1954 (gage height, 8.16 ft); maximum gage height, 9.15 ft Feb. 12, 1955 (ice jam); minimum daily discharge, 992 cfs Oct. 10, 1966.

Remarks.--Records good except those for the winter periods, which are fair. Flow regulated at all stages by powerplant 21 miles above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1,360	2,110	2,140	1,700	2,420	2,300	2,580	1,940	2,100	2,420	1,770	1,190
2	1,400	2,490	1,880	1,500	3,150	1,800	2,370	1,920	1,700	2,190	1,730	1,380
3	1,810	2,900	1,570	2,000	3,320	1,600	2,430	1,930	1,500	2,110	1,430	1,750
4	1,720	3,190	1,550	1,500	3,320	1,500	2,620	1,870	1,860	1,840	1,340	1,690
5	1,830	2,650	2,000	2,200	2,310	2,000	2,400	1,820	1,890	1,670	1,300	1,530
6	1,670	2,550	1,890	1,800	2,160	2,100	1,900	1,550	1,800	1,810	1,600	1,740
7	1,490	2,380	2,040	1,100	2,420	2,000	1,800	1,630	1,800	1,510	1,940	1,560
8	1,190	2,050	2,050	1,500	2,630	2,100	2,290	1,750	1,830	1,440	1,940	1,310
9	1,290	2,020	2,050	1,700	2,710	2,040	1,800	1,810	1,370	1,930	1,730	1,380
10	1,700	2,040	1,760	1,800	2,300	1,930	2,240	1,660	1,210	1,870	1,520	2,040
11	1,890	2,140	1,960	1,600	1,700	1,790	2,090	1,900	1,640	1,800	1,410	1,830
12	1,770	2,060	2,050	1,700	1,000	2,280	1,980	1,540	1,850	1,770	1,170	1,790
13	1,700	2,300	2,360	2,100	1,700	2,190	2,260	1,820	1,800	1,710	1,600	1,590
14	1,730	2,460	2,350	1,600	1,700	2,380	2,160	1,360	1,800	1,500	1,460	1,430
15	1,470	2,550	2,570	1,300	1,800	2,280	1,550	1,620	1,700	1,430	1,550	1,220
16	1,700	2,540	2,250	2,000	2,100	1,900	1,900	1,660	1,550	1,780	1,540	1,440
17	2,010	2,830	2,040	2,000	2,400	1,990	2,240	1,710	1,230	1,570	1,640	1,570
18	2,130	2,340	1,840	2,050	1,800	2,840	2,240	1,730	1,670	1,740	1,230	1,340
19	1,860	1,700	2,130	1,800	1,400	3,010	2,020	1,790	1,670	2,170	1,410	1,870
20	1,970	1,960	2,090	2,000	2,000	3,520	2,280	1,950	1,840	1,890	1,810	1,720
21	1,510	2,230	2,120	1,800	1,900	4,310	1,950	1,670	1,590	1,450	1,850	1,800
22	1,280	2,340	2,180	1,700	2,300	4,830	1,580	1,560	1,670	1,370	1,700	1,270
23	1,440	2,040	2,270	2,100	1,800	3,470	2,090	1,730	1,530	1,720	1,640	1,390
24	1,620	1,970	2,210	2,200	1,900	2,420	2,170	1,400	1,440	1,640	1,470	1,890
25	1,880	2,120	2,170	1,700	1,500	2,230	2,340	1,800	1,800	1,660	1,210	1,910
26	1,960	1,660	1,860	1,500	1,900	2,710	2,580	1,800	1,890	1,590	1,090	2,050
27	2,070	1,930	2,320	1,300	1,800	2,470	2,720	1,700	2,360	1,660	1,350	1,830
28	1,820	2,170	2,000	1,900	1,800	2,540	2,360	1,800	2,820	1,460	1,480	1,750
29	1,340	2,170	1,400	1,700	1,900	2,870	1,930	2,300	2,950	1,320	1,430	1,360
30	1,580	2,090	1,300	2,320	------	3,210	2,070	2,400	2,720	1,680	1,570	1,390
31	1,850	------	1,400	2,300	------	2,820	------	1,900	------	1,700	1,420	------
TOTAL	52,040	67,980	61,800	55,470	61,140	77,430	64,940	55,020	54,580	53,400	47,330	48,010
MEAN	1,679	2,266	1,994	1,789	2,108	2,498	2,165	1,775	1,819	1,723	1,527	1,600
MAX	2,130	3,190	2,570	2,320	3,320	4,830	2,720	2,400	2,950	2,420	1,940	2,050
MIN	1,190	1,660	1,300	1,100	1,000	1,500	1,550	1,360	1,210	1,320	1,090	1,190
CFSM	.94	1.27	1.12	1.01	1.18	1.40	1.22	1.00	1.02	.97	.86	.90
IN.	1.09	1.42	1.29	1.16	1.28	1.62	1.36	1.15	1.14	1.12	.99	1.00

CAL YR 1967 TOTAL 808,290 MEAN 2,214 MAX 6,060 MIN 1,030 CFSM 1.24 IN 16.89
WTR YR 1968 TOTAL 699,140 MEAN 1,910 MAX 4,830 MIN 1,000 CFSM 1.07 IN 14.61

4-1262. Little Manistee River near Freesoil, Mich.

Location.--Lat 44°11'00", long 86°10'00", in NE¼NE¼ sec.31, T.21 N., R.15 W., on right bank 25 ft upstream from Sixmile Bridge, 5.8 miles north of Freesoil, 7.4 miles upstream from mouth, and 9.0 miles southeast of Manistee.

Drainage area.--200 sq mi.

Records available.--October 1956 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 610 ft (from survey level line in vicinity).

Average discharge.--12 years, 171 cfs.

Extremes.--Maximum discharge during year, 313 cfs Mar. 20 (gage height, 2.67 ft); minimum, 124 cfs Jan. 5.
1956-68: Maximum discharge, 575 cfs Apr. 6, 1959 (gage height, 3.70 ft); minimum, 71 cfs Feb. 11, 1958, result of freeze-up.

Remarks.--Records good. Some regulation above station. Records of water temperatures for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	172	206	183	143	239	180	217	188	205	199	149	145
2	163	230	183	150	271	181	219	185	201	187	143	163
3	158	237	181	155	240	179	214	181	201	179	140	170
4	154	228	179	150	230	179	228	181	190	172	138	163
5	151	215	178	127	240	179	230	181	181	170	140	154
6	149	205	179	140	230	179	223	179	178	167	145	154
7	149	196	185	149	241	178	214	176	172	163	167	149
8	151	187	196	152	232	181	205	170	169	165	163	151
9	160	185	203	160	217	196	199	170	165	165	156	152
10	167	183	196	170	185	215	196	169	165	163	149	154
11	167	199	194	170	185	217	194	165	176	161	142	169
12	160	221	203	170	185	214	188	165	178	158	138	169
13	163	226	217	174	185	200	187	163	174	154	136	154
14	163	223	230	174	190	194	187	169	170	152	136	149
15	163	217	210	178	190	192	192	170	167	151	134	145
16	167	205	192	169	185	205	192	188	163	147	134	142
17	170	197	185	170	170	230	190	192	161	147	143	140
18	165	205	185	174	170	259	192	197	165	163	151	142
19	160	215	187	185	170	298	192	199	176	170	149	152
20	156	217	187	176	170	307	190	203	178	169	143	167
21	154	205	192	172	165	296	196	205	170	156	140	163
22	152	199	210	170	170	275	197	192	167	149	136	158
23	152	197	226	169	170	244	197	183	167	145	134	154
24	163	196	215	145	170	230	208	176	170	145	134	163
25	169	194	201	155	165	224	235	172	181	143	133	188
26	169	199	190	165	170	228	233	176	203	142	133	212
27	170	201	160	170	190	230	219	190	241	145	133	196
28	169	197	160	174	188	230	205	215	251	154	131	178
29	167	188	165	187	187	224	197	235	242	149	129	170
30	170	187	165	199	------	221	192	235	217	143	129	167
31	181	------	160	212	------	217	------	215	------	145	129	------
TOTAL	5,024	6,160	5,897	5,154	5,700	6,782	6,128	5,785	5,544	4,918	4,357	4,833
MEAN	162	205	190	166	197	219	204	187	185	159	141	161
MAX	181	237	230	212	271	307	235	235	251	199	167	212
MIN	149	183	160	127	165	178	187	163	161	142	129	140
CFSM	.810	1.02	.950	.830	.985	1.10	1.02	.935	.925	.795	.705	.805
IN	.93	1.15	1.10	.96	1.06	1.26	1.14	1.08	1.03	.91	.81	.90

CAL YR 1967	TOTAL 77,799	MEAN 213	MAX 444	MIN 143	CFSM 1.06	IN 14.47
WTR YR 1968	TOTAL 66,282	MEAN 181	MAX 307	MIN 127	CFSM .905	IN 12.33

4-1270. Boardman River near Mayfield, Mich.

Location.--Lat 44°38'20", long 85°31'10", in SE¼NE¼ sec.21, T.26 N., R.10 W., on right bank 25 ft downstream from Brown's Bridge, 300 ft downstream from East Creek, 0.9 mile downstream from Brown's Bridge Dam, 1.0 mile northeast of Mayfield, and 9.6 miles southeast of Traverse City.

Drainage area.--223 sq mi.

Records available.--June 1952 to September 1968.

Gage.--Digital water-stage recorder. Altitude of gage is 760 ft (by barometer). Prior to July 17, 1964, graphic water-stage recorder at same site and datum.

Average discharge.--16 years, 190 cfs.

Extremes.--Maximum discharge during year, 553 cfs Apr. 3 (gage height, 4.98 ft); minimum, 47 cfs July 21 (gage height, 2.73 ft); minimum daily, 98 cfs Aug. 17, 18.
1952-68: Maximum discharge, 1,220 cfs Sept. 14, 1961 (gage height, 6.90 ft); minimum, 30 cfs Jan. 15, 1965 (gage height, 2.53 ft); minimum daily, 47 cfs Nov. 2, 3, 1963.

Remarks.--Records good. Flow regulated by powerplant 0.9 mile above station. Records of water temperatures for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	186	201	190	179	249	170	269	233	206	184	179	137
2	186	285	188	183	277	150	171	227	213	180	167	164
3	187	307	189	182	259	170	260	199	189	176	136	162
4	186	303	190	182	192	190	460	194	209	172	128	150
5	186	294	234	179	191	174	334	194	202	155	127	128
6	171	257	279	182	189	172	290	206	196	167	126	136
7	154	186	285	179	265	194	261	210	169	178	139	121
8	157	186	177	178	246	206	176	192	169	152	199	127
9	172	189	187	178	180	198	176	169	169	161	175	152
10	188	274	192	178	180	206	202	184	176	154	152	156
11	187	244	196	178	185	202	233	208	242	135	139	162
12	184	378	217	180	180	176	186	195	237	147	120	156
13	185	227	292	180	183	150	157	189	202	174	121	152
14	187	344	228	180	182	150	182	172	112	159	118	150
15	185	340	271	180	182	148	280	173	135	135	120	147
16	188	286	244	179	182	172	244	199	146	126	165	144
17	186	238	231	180	158	218	219	264	148	146	98	146
18	184	179	187	180	159	249	190	219	169	201	98	151
19	183	180	188	182	159	326	192	219	204	188	148	178
20	182	159	187	182	168	417	218	233	198	142	269	169
21	182	180	237	182	167	417	217	215	244	139	187	147
22	179	195	316	181	221	294	207	205	237	148	126	146
23	178	255	195	179	210	186	242	201	182	152	121	142
24	178	275	231	176	200	206	268	207	159	149	120	157
25	182	272	289	181	170	263	315	205	172	147	130	160
26	179	261	179	179	142	276	214	206	196	132	144	159
27	179	172	182	177	140	360	209	218	243	103	146	148
28	181	152	182	178	140	374	227	216	266	130	140	178
29	180	184	181	203	140	234	250	187	258	150	142	176
30	183	279	182	244	------	168	230	197	235	166	134	154
31	199	------	180	229	------	394	------	195	------	180	125	------
TOTAL	5,624	7,282	6,706	5,710	5,496	7,210	7,079	6,331	5,883	4,828	4,439	4,555
MEAN	181	243	216	184	190	233	236	204	196	156	143	152
MAX	199	378	316	244	277	417	460	264	266	201	269	178
MIN	154	152	177	176	140	148	157	169	112	103	98	121
CFSM	.81	1.09	.97	.83	.85	1.04	1.06	.92	.88	.70	.64	.68
IN.	.94	1.21	1.12	.95	.92	1.20	1.18	1.06	.98	.81	.74	.76

CAL YR 1967 TOTAL 83,567 MEAN 229 MAX 593 MIN 140 CFSM 1.03 IN 13.94
WTR YR 1968 TOTAL 71,143 MEAN 194 MAX 460 MIN 98 CFSM .87 IN 11.86

4-1278. Jordan River near East Jordan, Mich.

Location.--Lat 45°06'09", long 85°05'53", in NW¼NW¼ sec.7, T.31 N., R.6 W., on right bank 600 ft downstream from Webster Bridge, 4.2 miles south of East Jordan.

Drainage area.--67.6 sq mi.

Records available.--October 1966 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 610 ft (from topographic map).

Extremes.--Maximum discharge during year, 612 cfs July 9 (gage height, 5.22 ft); minimum, 121 cfs Feb. 17, result of freeze-up.
1966-68: Maximum discharge, that of July 9, 1968; minimum, 109 cfs Mar. 1, 8, 1967, result of freeze-up.
Maximum discharge known since 1959, 703 cfs May 8, 1963 (gage height, 5.32 ft).

Remarks.--Records good. Records of water temperatures for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	174	212	174	155	215	165	194	174	170	239	162	154
2	166	298	174	155	225	167	186	173	170	179	155	161
3	161	218	174	155	190	165	186	174	166	168	150	158
4	160	215	173	155	185	167	245	190	161	162	150	155
5	158	202	173	155	185	167	224	176	158	162	152	172
6	158	196	178	150	175	167	196	172	155	156	161	166
7	158	190	200	150	175	166	191	172	155	154	176	172
8	167	186	212	150	170	170	186	170	154	155	158	170
9	179	198	182	155	155	182	182	173	152	421	158	164
10	190	220	176	155	149	192	190	172	152	209	155	168
11	180	314	184	155	155	180	182	170	190	174	152	179
12	168	262	240	155	165	174	178	168	185	167	150	160
13	170	216	210	160	170	165	176	170	174	166	152	160
14	182	198	184	160	170	160	185	168	164	158	149	155
15	168	190	174	167	170	172	215	170	162	154	149	155
16	180	182	176	160	170	192	186	174	158	152	150	155
17	172	188	174	165	165	222	178	206	158	150	152	154
18	173	209	185	173	165	266	186	176	164	180	150	156
19	172	203	191	180	165	380	180	170	185	176	190	160
20	166	186	178	176	165	302	176	170	162	160	206	176
21	167	180	334	174	160	224	188	168	167	158	164	162
22	164	182	259	173	160	200	179	166	179	156	168	157
23	162	185	198	170	165	191	191	166	164	154	191	156
24	160	180	188	156	165	188	246	162	161	156	161	276
25	164	185	186	160	165	198	224	160	160	154	158	204
26	172	210	170	165	160	234	204	160	176	152	160	182
27	170	191	165	172	165	234	191	182	233	184	156	182
28	173	184	160	173	167	250	180	204	210	167	155	173
29	166	180	160	190	167	218	178	184	180	155	152	167
30	184	178	160	203	------	200	178	178	372	154	150	163
31	233	------	150	182	------	202	------	174	------	155	152	------
TOTAL	5,317	6,138	5,842	5,104	4,958	6,260	5,781	5,392	5,297	5,387	4,944	5,072
MEAN	172	205	188	165	171	202	193	174	177	174	159	169
MAX	233	314	334	203	225	380	246	206	372	421	206	276
MIN	158	178	150	150	149	160	176	160	152	150	149	154
CFSM	2.54	3.03	2.78	2.44	2.53	2.99	2.86	2.57	2.62	2.57	2.35	2.50
IN.	2.93	3.38	3.21	2.81	2.73	3.44	3.18	2.97	2.91	2.96	2.72	2.79

CAL YR 1967	TOTAL	66,887	MEAN	183	MAX	443	MIN	137	CFSM	2.71	IN	36.80
WTR YR 1968	TOTAL	65,492	MEAN	179	MAX	421	MIN	149	CFSM	2.65	IN	36.03

PEAK DISCHARGE (BASE, 350 CFS)

Date	Time	G.HT.	Discharge
11-11	0830	4.40	360
03-19	1700	4.63	409
06-30	1330	5.14	570
07-09	1300	5.22	612
09-24	1600	4.45	370

GPO 817-436-10

STREAMS TRIBUTARY TO LAKE HURON

4-1280. Sturgeon River near Wolverine, Mich.

Location.--Lat 45°17'55", long 84°36'40", in SE¼NE¼ sec.36, T.34 N., R.3 W., on left bank 1.8 miles north of Wolverine, 2.8 miles downstream from West Branch, and 9 miles upstream from mouth.

Drainage area.--170 sq mi, approximately.

Records available.--April 1942 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 740 ft (from topographic map). Prior to June 15, 1942, staff gage at site 1.0 mile upstream at different datum. June 16, 1942, to Sept. 30, 1958, staff gage at site 0.7 mile upstream at different datum.

Average discharge.--26 years, 201 cfs.

Extremes.--Maximum discharge during year, 562 cfs Mar. 20 (gage height, 2.82 ft); maximum gage height, 3.02 ft Jan. 12 (backwater from ice); minimum discharge, 134 cfs Aug. 14; minimum daily discharge, 142 cfs July 26, Aug. 14-18.
1942-68: Maximum discharge, 1,180 cfs Sept. 14, 1961 (gage height, 4.48 ft); minimum, 96 cfs Aug. 13, 1959; minimum daily, 113 cfs Aug. 6, 1958, site and datum then in use.

Remarks.--Records good. Intermittent regulation at low flows from ponds 2.4 miles above station. Records of water temperatures for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	215	272	210	190	320	200	286	204	218	271	184	161
2	195	375	210	190	370	195	259	201	215	201	159	170
3	190	314	210	190	350	195	250	201	206	186	150	170
4	185	266	208	185	320	198	286	204	195	170	148	164
5	182	242	205	185	300	198	289	201	189	167	150	201
6	182	236	210	185	300	195	244	189	186	159	164	206
7	182	228	222	180	290	195	241	186	178	150	215	195
8	198	222	242	180	280	198	238	186	178	150	175	186
9	212	233	218	185	260	201	236	189	175	161	170	181
10	212	248	212	190	230	215	236	198	175	156	159	201
11	210	290	215	195	230	212	227	192	201	148	153	265
12	198	284	278	195	230	195	224	192	206	148	150	212
13	195	260	284	200	230	190	221	201	195	156	150	181
14	198	245	236	200	230	185	233	201	178	150	142	175
15	198	228	222	200	230	201	283	201	181	150	142	167
16	212	222	218	190	225	227	250	209	175	150	142	161
17	212	233	215	205	210	268	227	238	164	145	142	161
18	205	245	225	220	200	317	236	215	175	167	142	159
19	202	245	242	220	200	455	227	195	192	178	230	161
20	195	228	225	230	200	515	224	189	175	159	348	212
21	208	220	278	210	195	384	256	195	181	159	236	201
22	202	220	336	200	200	317	230	189	212	159	221	178
23	195	222	266	190	200	286	221	189	184	153	262	172
24	192	222	239	180	200	271	250	186	175	156	204	327
25	192	218	233	185	200	274	265	181	170	150	184	298
26	208	225	210	190	195	314	247	178	172	142	181	218
27	208	222	200	200	200	352	233	215	247	170	172	206
28	208	218	190	210	200	396	218	280	241	175	167	201
29	200	212	190	230	200	388	209	250	215	156	161	186
30	205	212	190	250	------	338	206	241	218	150	161	178
31	269	------	180	270	------	310	------	233	------	159	161	------
TOTAL	6.265	7.307	7.019	6.230	6.995	8.385	7.252	6.329	5.772	5.051	5.525	5.854
MEAN	202	244	226	201	241	270	242	204	192	163	178	195
MAX	269	375	336	270	370	515	289	280	247	271	348	327
MIN	182	212	180	180	195	185	206	178	164	142	142	159
CFSM	1.19	1.44	1.33	1.18	1.42	1.59	1.42	1.20	1.13	.959	1.05	1.15
IN	1.37	1.60	1.54	1.36	1.53	1.83	1.59	1.38	1.26	1.10	1.21	1.28

CAL YR 1967	TOTAL 82,153	MEAN 225	MAX 739	MIN 158	CFSM 1.32	IN. 17.97
WTR YR 1968	TOTAL 77,984	MEAN 213	MAX 515	MIN 142	CFSM 1.25	IN. 17.06

4-1285. Indian River at Indian River, Mich.

Location.--Lat 45°24'40", long 84°37'10", in NE¼SW¼ sec.24, T.35 N., R.3 W., on left bank at Indian River, 500 ft downstream from Burt Lake and 2.3 miles upstream from Mullett Lake.

Drainage area.--583 sq mi.

Records available.--April 1942 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 590.21 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Nov. 12, 1942, staff gage at site 100 ft downstream at same datum.

Average discharge.--26 years, 543 cfs.

Extremes.--Maximum daily discharge during year, 682 cfs Apr. 25, 26, 29, 30; maximum daily gage height, 4.60 ft Aug. 25; minimum daily discharge, 338 cfs Aug. 18; minimum daily gage height, 3.54 ft. Mar. 16-18.
1942-68: Maximum daily discharge, 1,140 cfs May 22, 23, 1960; maximum daily gage height, 5.58 ft May 13, 14, 1960; minimum daily discharge, 249 cfs Sept. 9, 1955; minimum daily gage height, 3.34 ft Oct. 21, 1957.

Remarks.--Records fair. Seasonal distribution of flow modified by regulation from dam at Cheboygan.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	401	486	500	600	555	530	540	673	599	554	375	560
2	406	540	496	600	570	530	520	664	608	545	383	565
3	410	555	486	600	580	520	505	654	608	520	378	570
4	410	565	482	600	590	510	515	644	590	502	378	565
5	414	565	473	580	600	510	511	635	590	502	378	590
6	406	565	460	560	610	510	511	608	590	486	383	600
7	392	575	464	580	620	510	502	581	581	468	401	600
8	410	560	468	600	630	510	480	563	572	452	406	605
9	419	570	455	600	640	505	511	581	590	477	410	615
10	419	560	450	600	640	496	520	563	563	460	401	625
11	419	595	460	600	650	491	511	563	572	452	388	630
12	410	610	473	580	650	486	486	554	608	452	370	620
13	406	615	473	570	650	473	520	536	581	452	365	620
14	419	635	473	570	650	464	520	536	563	444	365	610
15	424	615	491	570	650	455	545	536	545	444	352	600
16	437	600	505	570	650	450	536	563	520	444	352	595
17	437	605	505	570	640	450	545	608	511	436	356	580
18	446	605	496	560	630	450	563	599	502	430	338	570
19	437	605	491	560	620	473	563	608	511	430	374	560
20	428	590	486	565	610	505	563	599	486	430	505	565
21	432	580	520	560	600	520	590	581	494	410	496	565
22	424	575	580	555	590	520	599	572	511	420	491	560
23	424	575	615	545	580	515	617	563	502	420	505	555
24	419	550	620	535	570	515	635	545	502	420	525	590
25	414	550	645	520	560	510	682	536	486	410	530	600
26	442	555	620	515	550	515	682	502	486	400	540	595
27	446	550	580	520	540	520	673	528	511	410	535	600
28	437	535	560	530	530	540	673	563	536	428	530	595
29	428	525	580	530	530	555	682	581	545	388	530	585
30	442	515	600	540	------	555	682	599	554	378	545	570
31	473	------	600	540	------	550	------	590	------	375	550	------
TOTAL	13131	17126	16107	17525	17485	15643	16982	18028	16417	13839	13435	17660
MEAN	424	571	520	565	603	505	566	582	547	446	433	589
MAX	473	635	645	600	650	555	682	673	608	554	550	630
MIN	392	486	450	515	530	450	480	502	486	375	338	555
CFSM	.727	.979	.892	.969	1.03	.866	.971	.998	.938	.765	1743	1.01
IN	.84	1.09	1.03	1.12	1112	1.00	1.08	1.15	1.05	.88	.86	1.13

CAL YR	1967	TOTAL	210,585	MEAN	577	MAX	1,010	MIN	360	CFSM	.990	IN	13.43
WTR YR	1968	TOTAL	193,378	MEAN	528	MAX	682	MIN	338	CFSM	.906	IN	12.34

4-1290. Pigeon River near Vanderbilt, Mich.

Location.--Lat 45°10'15", long 84°26'20", in SE¼SW¼ sec.9, T.32 N., R.1 W., on right bank at Pigeon River Fisheries Experiment Station and 11.1 miles east of Vanderbilt.

Drainage area.--63 sq mi, approximately.

Records available.--September 1950 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 886.24 ft above mean sea level, datum of 1929. Prior to Apr. 16, 1964, graphic water-stage recorder at same site and datum.

Average discharge.--18 years, 74.9 cfs.

Extremes.--Maximum discharge during year, 230 cfs Nov. 2 (gage height, 3.97 ft); minimum, 43 cfs Oct. 23.
1950-68: Maximum discharge, 1,500 cfs May 15, 1957 (gage height, 6.80 ft, from floodmark), from rating curve extended above 500 cfs by logarithmic plotting, result of failure of Lansing Club Dam; minimum, 13 cfs Jan. 8, 1957.

Remarks.--Records good. Prior to May 16, 1957, and since Apr. 22, 1958, occasional regulation by Lansing Club Dam 3.5 miles above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	86	122	73	60	78	65	118	75	73	96	96	56
2	74	184	73	62	100	62	86	74	74	74	75	56
3	72	168	73	62	80	64	89	74	74	61	61	57
4	66	106	72	62	93	65	107	75	69	59	59	57
5	59	98	72	62	95	69	123	75	65	61	59	68
6	60	100	73	62	85	80	92	73	64	67	65	82
7	64	83	78	62	79	73	83	71	55	58	75	64
8	64	84	87	60	79	70	94	69	59	57	63	61
9	76	82	89	60	77	75	90	69	65	58	63	66
10	76	84	73	60	70	71	84	70	62	61	60	74
11	75	113	75	62	70	74	85	69	63	59	60	91
12	70	134	108	62	70	73	82	68	68	57	58	87
13	66	101	141	64	70	70	82	69	68	57	57	67
14	67	94	101	64	70	65	94	71	62	56	56	60
15	70	85	91	64	70	70	106	75	63	55	56	60
16	74	77	80	64	70	75	86	79	61	78	55	59
17	81	77	79	63	67	84	93	83	60	75	57	58
18	81	82	77	60	66	103	92	84	61	66	53	58
19	76	90	83	62	66	139	85	81	63	74	69	57
20	67	86	83	66	66	162	85	73	68	68	134	59
21	60	82	84	70	66	131	90	68	68	61	106	65
22	79	79	111	73	66	101	103	68	74	57	76	65
23	65	76	109	71	65	91	90	69	71	57	113	64
24	69	70	90	65	65	84	114	67	64	57	90	80
25	73	72	83	62	65	84	98	64	62	57	64	140
26	67	97	81	62	65	92	96	67	67	57	59	83
27	74	82	70	64	65	134	93	80	93	58	60	72
28	82	76	65	66	65	140	76	118	107	72	59	81
29	73	74	65	68	65	158	75	99	77	69	58	70
30	75	73	62	72	------	120	84	101	87	58	57	68
31	105	------	62	75	------	120	------	92	------	64	55	------
TOTAL	2,246	2,831	2,563	1,991	2,108	2,864	2,775	2,370	2,067	1,984	2,128	2,085
MEAN	72.5	94.4	82.7	64.2	72.7	92.4	92.5	76.5	68.9	63.4	68.6	69.5
MAX	105	184	141	75	100	162	123	118	107	96	134	140
MIN	59	70	62	60	65	62	75	64	55	55	53	56
CFSM	1.15	1.50	1.31	1.02	1.15	1.47	1.47	1.21	1.09	1.01	1.09	1.10
IN.	1.33	1.67	1.51	1.18	1.24	1.69	1.64	1.40	1.22	1.16	1.26	1.23

CAL YR 1967	TOTAL 29,338	MEAN 80.4	MAX 298	MIN 51	CFSM 1.28	IN 17.32
WTR YR 1968	TOTAL 27,992	MEAN 76.5	MAX 184	MIN 53	CFSM 1.21	IN 16.52

4-1295. Pigeon River at Afton, Mich.

Location.--Lat 45°22'25", long 84°30'55", in NW¼NE¼ sec.2, T.34 N., R.2 W., on upstream side of bridge on State Highway 68, 0.9 mile west of Afton, 2.2 miles downstream from Wilkes Creek, and 7 miles upstream from Mullett Lake.

Drainage area.--159 sq mi.

Records available.--April 1942 to September 1968.

Gage.--Wire-weight gage read twice daily. Altitude of gage is 675 ft (by barometer). Prior to Oct. 1, 1961, staff gages at various sites upstream at present datum.

Average discharge.--26 years, 134 cfs.

Extremes.--Maximum discharge during year, 452 cfs Mar. 20 (gage height, 5.66 ft); maximum gage height, 6.30 ft Jan. 31 (backwater from ice); minimum discharge, 70 cfs Aug. 15.

1942-68: Maximum discharge, 1,170 cfs Apr. 17, 1960 (gage height, 6.80 ft, from high-water mark); maximum gage height, about 10.5 ft Mar. 31, 1943, from floodmarks (ice jam); minimum discharge, 49 cfs Aug. 8, 1958.

Remarks.--Records good except those for the winter periods, which are fair. Occasional regulation by Lansing Club Dam about 22 miles above station.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	155	176	130	105	140	110	230	138	155	133	103	95
2	140	227	130	110	180	110	212	131	131	111	121	109
3	128	287	125	115	150	115	181	121	127	111	97	105
4	120	309	125	115	170	115	193	121	119	91	83	103
5	114	214	120	115	175	115	218	129	111	87	81	121
6	102	185	125	115	150	140	220	125	105	89	95	142
7	104	171	135	115	140	130	181	121	101	93	107	142
8	116	155	150	110	140	140	173	117	93	85	121	125
9	124	155	159	110	135	140	169	117	93	87	99	117
10	130	159	153	110	125	140	169	117	95	87	93	133
11	132	176	142	115	125	140	164	113	97	83	85	171
12	126	205	178	115	125	140	160	111	101	81	83	166
13	122	227	220	115	115	135	160	115	109	81	83	140
14	122	193	180	115	115	130	164	117	97	79	79	111
15	122	178	160	115	115	140	176	121	95	79	74	105
16	128	159	140	115	115	160	185	131	91	85	76	101
17	132	155	140	115	110	200	162	155	87	111	79	99
18	138	157	135	110	110	260	171	148	83	113	79	97
19	138	161	145	110	110	350	176	140	89	107	103	97
20	128	159	145	120	110	417	164	127	93	99	346	107
21	118	155	150	125	115	381	173	121	103	93	303	109
22	124	148	180	130	115	296	176	113	113	103	260	107
23	132	142	190	125	115	208	178	113	111	87	240	105
24	112	138	160	120	115	185	190	113	103	81	232	205
25	120	134	150	110	115	185	205	101	99	81	181	266
26	126	142	135	110	115	212	195	101	101	81	131	242
27	120	159	110	115	115	260	176	117	140	89	117	181
28	134	135	110	120	115	345	160	160	169	97	111	148
29	128	130	110	120	115	342	138	193	166	103	107	140
30	120	130	110	125	------	320	142	178	129	95	91	127
31	148	------	110	130	------	240	------	171	------	93	93	------
TOTAL	3,903	5,221	4,452	3,595	3,690	6,301	5,361	3,996	3,306	2,895	3,953	4,016
MEAN	126	174	144	116	127	203	179	129	110	93.4	128	134
MAX	155	309	220	130	180	417	230	193	169	133	346	266
MIN	102	130	110	105	110	110	138	101	83	79	74	95
CFSM	.792	1.09	.906	.730	.799	1.28	1.13	.811	.692	.587	.805	.843
IN	.91	1.22	1.04	.84	.86	1.47	1.25	.93	.77	.68	.92	.94

CAL YR 1967	TOTAL 56,084	MEAN 154	MAX 728	MIN 87	CFSM .969	IN 13.12
WTR YR 1968	TOTAL 50,689	MEAN 138	MAX 417	MIN 74	CFSM .868	IN 11.86

STREAMS TRIBUTARY TO LAKE HURON

4-1300. Cheboygan River near Cheboygan, Mich.

Location.--Lat 45°34'40", long 84°29'15", in SW¼ sec.19, T.37 N., R.1 W., 300 ft downstream from Mullett Lake, 2½ miles upstream from Black River, and 5 miles south of Cheboygan.

Drainage area.--865 sq mi.

Records available.--October 1942 to September 1968. Monthly discharge only for October 1942, published in WSP 1307.

Gage.--Water-stage recorders. Datum of gage is 591.21 ft above mean sea level, datum of 1929. Auxiliary water-stage recorder at Cheboygan 5.1 miles downstream. Datum of auxiliary gage is 590.00 ft above mean sea level, datum of 1929. Prior to Aug. 30, 1967, auxiliary staff gage at Cheboygan 5.2 miles downstream at same datum, read hourly.

Average discharge.--26 years, 776 cfs.

Extremes.--Maximum daily discharge during year, 1,510 cfs Aug. 24; maximum daily gage height, 2.73 ft Aug. 20, 23; minimum daily discharge, 350 cfs Apr. 19; minimum daily gage height, 1.34 ft Mar. 15.
1942-68: Maximum daily discharge, 1,640 cfs May 8, 1959; maximum daily gage height, 3.27 ft May 13, 14, 1960; minimum daily discharge, 90 cfs Mar. 29, 30, 1958; minimum daily gage height, 1.12 ft Dec. 29, 1952.

Remarks.--Records fair. Flow regulated by dam at Cheboygan; prior to Dec. 31, 1965, flow affected by variable backwater from powerplant at Cheboygan 5.2 miles below station and by Alverno powerplant.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	483	769	702	900	600	750	966	847	852	721	618	1.140
2	499	901	687	900	630	750	941	839	859	581	601	1.110
3	492	979	730	850	670	740	954	823	838	609	606	1.130
4	514	959	732	850	700	740	946	832	762	638	624	1.220
5	571	951	827	860	750	730	953	827	666	620	615	1.160
6	561	1.030	943	890	800	720	956	826	666	594	637	1.150
7	561	1.140	1.050	900	850	710	956	858	657	637	645	1.140
8	569	1.140	1.030	900	900	717	948	818	626	667	646	1.130
9	615	1.130	975	900	950	725	931	758	642	669	644	1.090
10	612	1.110	961	900	1.000	720	802	755	611	582	666	1.050
11	651	1.070	944	880	1.050	718	776	672	620	584	670	978
12	565	1.110	982	850	1.050	712	787	673	650	590	670	936
13	495	1.100	1.020	888	1.050	702	811	666	700	589	640	768
14	582	1.040	1.050	890	1.080	697	821	697	800	596	660	762
15	628	1.040	973	895	1.060	684	812	711	790	588	650	762
16	652	1.030	880	861	1.060	681	705	686	663	588	482	770
17	581	994	791	820	1.050	630	495	679	662	507	474	753
18	636	958	835	808	1.000	615	365	847	671	495	416	752
19	689	958	778	771	970	825	350	888	710	499	351	752
20	630	981	778	724	950	931	369	898	788	516	1.080	726
21	617	1.000	773	850	930	936	363	932	810	472	1.370	758
22	617	990	1.020	785	910	927	371	930	785	493	1.410	762
23	588	982	1.170	727	900	920	431	920	762	509	1.490	847
24	631	998	1.100	767	880	913	561	890	783	537	1.510	959
25	673	995	1.050	898	850	901	703	850	777	549	1.490	996
26	720	1.010	1.000	779	820	896	720	750	733	547	1.430	985
27	769	988	950	514	770	901	720	750	695	541	1.380	1.000
28	763	837	900	521	760	895	720	760	676	564	1.280	1.030
29	729	792	884	540	760	907	730	760	723	600	1.210	1.040
30	735	770	895	560	------	934	831	845	858	587	1.200	1.010
31	738	------	900	580	------	956	------	845	------	581	1.200	------
TOTAL	19.166	29.752	28.310	24.758	25.750	24.583	21.794	24.832	21.835	17.850	27.365	28.666
MEAN	618	992	913	799	888	793	726	801	728	576	883	956
MAX	769	1,140	1,170	900	1,080	956	966	932	859	721	1,510	1,220
MIN	483	769	687	514	600	615	350	666	611	472	351	726
CFSM	.714	1.15	1.06	.924	1.03	.917	.839	.926	.842	.666	1.02	1.11
IN	.82	1.28	1.22	1.06	1.11	1.06	.94	1.07	.94	.77	1.18	1.23

CAL YR 1967	TOTAL 333,160	MEAN 913	MAX 1,500	MIN 396	CFSM 1.06	IN 14.32
WTR YR 1968	TOTAL 294,661	MEAN 805	MAX 1,510	MIN 350	CFSM .931	IN 12.67

4-1305. Black River near Tower, Mich.

Location.--Lat 45°23'35", long 84°20'00", in SE¼NE¼ sec.29, T.35 N., R.1 E., on right bank 400 ft downstream from Kleber Dam, 1,000 ft upstream from Milligan Creek, 3.0 miles northwest of Tower, and 10.8 miles upstream from Black Lake.

Drainage area.--313 sq mi.

Records available.--October 1942 to September 1968. Monthly discharge only for October 1942, published in WSP 1307.

Gage.--Digital water-stage recorder. Datum of gage is 658.00 ft above mean sea level (Stanley Engineering Co. bench mark). Prior to Aug. 1, 1949, at site 1 mile upstream at different datum. Aug. 5, 1949, to Apr. 16, 1964, graphic water-stage recorder at same site and datum.

Average discharge.--26 years, 251 cfs.

Extremes.--Maximum discharge during year, 1,180 cfs Aug. 20 (gage height, 5.06 ft); minimum, 5.8 cfs Jan. 11, Aug. 19; minimum daily, 67 cfs Sept. 22.

1942-68: Maximum discharge, 2,340 cfs Apr. 17, 1960 (gage height, 713 ft); minimum, 0.6 cfs Mar. 11, 1950; minimum daily, 4.0 cfs Nov. 27, 1949.

Remarks.--Records good. Flow regulated by powerplant 400 ft above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	248	374	279	220	272	199	542	313	322	292	163	240
2	316	481	351	229	291	201	498	289	250	221	192	318
3	289	478	270	246	299	174	495	270	245	211	196	306
4	279	481	245	229	261	165	431	245	240	206	139	275
5	181	501	239	205	294	220	327	245	180	186	192	249
6	212	520	237	200	315	237	432	255	240	167	233	279
7	202	505	274	215	333	221	429	251	210	139	152	306
8	205	489	304	210	317	247	429	208	225	167	172	276
9	214	316	315	247	319	259	325	210	230	179	215	252
10	222	273	325	199	273	237	274	243	260	156	174	266
11	249	365	309	217	229	228	429	216	220	162	154	394
12	217	378	337	176	244	255	400	206	250	170	209	367
13	250	430	484	198	230	269	350	213	202	163	132	339
14	250	376	481	181	229	177	360	206	129	115	161	295
15	247	379	421	210	210	267	330	213	166	155	103	189
16	212	311	408	220	190	336	340	265	167	152	141	258
17	230	346	301	214	220	327	390	273	177	183	147	256
18	278	317	381	232	169	448	370	247	189	169	130	163
19	270	282	357	214	252	682	330	245	164	124	181	178
20	257	349	323	239	254	683	380	242	178	188	811	377
21	252	301	376	209	220	682	400	241	251	146	679	268
22	193	289	421	251	177	594	300	240	243	213	556	67
23	242	259	351	234	187	531	413	238	216	188	648	104
24	238	296	391	205	188	371	365	227	182	171	515	225
25	236	300	312	201	194	427	408	114	167	113	474	322
26	188	268	250	205	206	372	367	113	210	130	394	370
27	222	290	229	217	215	499	382	183	250	161	417	317
28	215	272	191	214	235	501	377	372	370	143	277	323
29	233	224	198	218	204	502	243	244	298	216	216	270
30	249	252	191	216	------	590	278	366	321	165	190	224
31	250	------	187	244	------	614	------	347	------	164	172	------
TOTAL	7,346	10,702	9,738	6,715	7,027	11,515	11,394	7,540	6,752	5,315	8,535	8,073
MEAN	237	357	314	217	242	371	380	243	225	171	275	269
MAX	316	520	484	251	333	683	542	372	370	292	811	394
MIN	181	224	187	176	169	165	243	113	129	113	103	67
CFSM	.76	1.14	1.00	.69	.77	1.19	1.21	.78	.72	.55	.88	.86
IN.	.87	1.27	1.16	.80	.83	1.37	1.35	.90	.80	.63	1.01	.96

CAL YR 1967 TOTAL 116,330 MEAN 319 MAX 1,460 MIN 133 CFSM 1.02 IN 13.82
WTR YR 1968 TOTAL 100,652 MEAN 275 MAX 811 MIN 67 CFSM .88 IN 11.96

STREAMS TRIBUTARY TO LAKE HURON

4-1315. Rainy River near Ocqueoc, Mich.

Location.--Lat 45°24'30", long 84°10'45", in NE¼NW¼ sec.22, T.35 N., R.2 E., on upstream side of highway bridge, 4.4 miles west of Ocqueoc and 5 miles upstream from Black Lake.

Drainage area.--85 sq mi, approximately.

Records available.--October 1952 to September 1968.

Gage.--Wire-weight gage read once daily. Datum of gage is 674.85 ft above mean sea level, unadjusted.

Average discharge.--16 years, 36.4 cfs.

Extremes.--Maximum discharge during year, 249 cfs Aug. 21 (gage height, 3.81 ft); maximum gage height, 3.84 ft Mar. 20 (backwater from ice); minimum discharge, 2.1 cfs Aug. 16.
1952-68: Maximum discharge, 946 cfs Apr. 18, 1960 (gage height, 6.33 ft, from floodmark); minimum, 0.4 cfs Sept. 7, 1955.

Remarks.--Records good except those for the winter periods, which are poor.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.8	13	22	20	39	10	138	56	40	20	3.5	43
2	6.2	21	22	20	49	11	127	52	36	15	3.2	43
3	5.3	32	22	18	63	12	119	47	33	11	2.7	44
4	4.5	43	23	18	50	12	114	47	26	10	2.5	50
5	4.5	45	27	18	40	12	108	45	25	9.7	2.4	56
6	4.0	41	31	17	32	12	103	41	22	8.5	3.5	52
7	3.6	36	39	17	30	13	95	39	24	8	8.5	47
8	4	32	49	17	30	14	91	37	26	6.9	5.0	45
9	4.5	31	51	17	32	17	86	35	22	6.2	5.2	43
10	7.4	36	45	18	32	20	82	32	18	6.0	5.2	52
11	6.5	44	37	18	30	22	79	31	19	5.2	4.5	65
12	6.2	50	57	17	28	22	78	30	19	4.8	3.2	56
13	6.2	54	96	17	26	21	75	28	20	4.5	2.7	52
14	6.2	51	85	17	22	20	76	26	17	4	2.4	48
15	7	42	65	17	20	22	77	26	15	3.7	2.4	41
16	9.2	37	50	17	17	23	76	36	14	3.2	2.4	38
17	9.2	32	45	18	16	60	76	45	13	3.2	5.0	33
18	9.5	30	35	20	14	110	77	46	13	3.7	10	30
19	9.5	30	30	24	13	180	76	40	14	3.8	41	30
20	9.2	26	28	27	13	240	74	36	13	4.5	166	29
21	8.9	25	28	25	12	210	74	33	14	4	235	30
22	9	25	28	21	12	180	75	31	16	3.8	211	30
23	9.2	25	28	19	11	150	78	28	15	3.4	222	30
24	9.5	25	27	18	11	120	81	24	15	3.0	206	55
25	8.9	23	27	17	11	117	81	22	13	2.7	170	52
26	8.3	23	25	16	10	127	84	24	13	2.4	112	41
27	8.9	22	24	15	10	155	84	28	22	2.4	88	39
28	9.5	22	23	15	10	192	80	30	27	3	75	36
29	9	22	22	15	10	213	69	35	27	3.4	62	30
30	9.2	22	21	19	------	199	64	38	23	3.5	51	28
31	11	------	21	30	------	160	------	40	------	3.5	45	------
TOTAL	229.9	960	1133	582	693	2676	2597	1108	614	177.0	1758.3	1268
MEAN	7.42	32.0	36.5	18.8	23.9	86.3	86.6	35.7	20.5	5.71	56.7	42.3
MAX	11	54	96	30	63	240	138	56	40	20	235	65
MIN	3.6	13	21	15	10	10	64	22	13	2.4	2.4	28
CFSM	.087	.376	.429	.221	.281	1.02	1.02	.420	.241	.067	.667	.498
IN	.10	.42	.50	.25	.30	1.17	1.14	.48	.27	.08	.77	.55

CAL YR 1967	TOTAL 19,860.0	MEAN 54.4	MAX 670	MIN 1.7	CFSM .640	IN 8.69
WTR YR 1968	TOTAL 13,796.2	MEAN 37.7	MAX 240	MIN 2.4	CFSM .444	IN 6.04

PEAK DISCHARGE (BASE, 110 CFS)

Date	Time	G.HT.	Discharge
03-20	0700	3.84	245
08-21	1600	3.81	249

4-1320. Black River near Cheboygan, Mich.

Location.--Lat 45°30'00", long 84°19'35", in NW¼NW¼ sec.21, T.36 N., R.1 E., on left bank 0.3 mile downstream from Black Lake, 5.3 miles upstream from Alverno Dam, and 12.6 miles southeast of Cheboygan.

Drainage area.--597 sq mi.

Records available.--October 1942 to September 1968. Monthly discharge only for October 1942, published in WSP 1307.

Gage.--Water-stage recorder. Datum of gage is 609.26 ft above mean sea level, datum of 1929. Auxiliary water-stage recorder 3 miles downstream at same datum.

Average discharge.--26 years, 424 cfs.

Extremes.--Maximum daily discharge during year, 1,360 cfs Aug. 24, 25; maximum daily gage height, 3.90 ft Aug. 24; minimum daily discharge, 96 cfs Aug. 18; minimum daily gage height, 1.60 ft Jan. 26.
1942-68: Maximum daily discharge, 2,500 cfs Apr. 20, 1960; maximum daily gage height, 5.74 ft Apr. 20, 1960; minimum daily discharge, 11 cfs Aug. 14, 1949; minimum daily gage height, about 1.10 ft Mar. 1, 1964.

Remarks.--Records poor. Flow regulated by Alverno Dam; prior to Dec. 31, 1965, flow regulated by powerplant at Alverno Dam.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	260	319	606	540	420	480	972	650	258	351	176	952
2	290	344	605	530	430	480	967	637	346	380	158	938
3	360	430	604	520	450	480	960	633	362	320	174	863
4	329	471	603	510	450	480	972	608	397	272	130	551
5	357	484	571	500	460	490	960	643	443	385	162	540
6	343	455	560	480	460	490	969	608	448	360	162	573
7	326	484	554	470	460	490	943	514	408	335	150	588
8	310	467	565	460	460	500	920	507	474	215	166	572
9	363	492	556	450	450	500	900	584	482	274	198	578
10	334	470	550	450	440	500	860	470	455	250	243	576
11	352	468	561	430	440	510	820	430	406	292	231	578
12	294	503	575	420	430	510	780	467	438	262	204	598
13	342	588	590	410	430	510	740	460	379	247	194	599
14	305	656	570	400	440	510	670	321	440	246	232	613
15	293	652	560	400	440	520	600	318	399	245	132	615
16	352	616	540	390	450	520	452	320	369	240	147	604
17	348	675	530	380	450	520	488	330	347	227	171	582
18	384	777	530	380	450	520	634	340	294	232	96	553
19	355	787	530	380	450	530	609	350	296	304	174	553
20	378	736	540	380	450	550	606	360	218	246	250	544
21	380	685	600	380	450	600	626	360	186	227	400	574
22	346	702	641	380	450	700	678	360	312	300	550	570
23	349	706	662	380	460	773	646	350	312	247	900	355
24	326	707	677	390	460	782	600	340	271	270	1,360	169
25	311	687	660	390	460	763	691	330	252	242	1,360	283
26	382	594	660	390	460	778	666	320	218	238	1,330	321
27	400	691	650	390	470	802	633	310	218	241	1,240	372
28	400	679	620	400	470	844	641	290	257	265	1,220	377
29	380	640	600	400	470	896	641	290	240	202	1,160	392
30	360	609	580	410	------	928	664	292	169	160	1,100	434
31	356	------	560	410	------	988	------	292	------	192	980	------
TOTAL	10,665	17,674	18,210	13,200	13,060	18,944	22,308	13,084	10,094	8,267	15,150	16,417
MEAN	344	589	587	426	450	611	744	422	336	267	489	547
MAX	400	787	677	540	470	988	972	650	482	385	1,360	952
MIN	260	319	530	380	420	480	452	290	169	160	96	169
CFSM	.576	.987	.983	.714	.754	1.02	1.25	.707	.563	.447	.819	.916
IN	.66	1.10	1.13	.82	.81	1.18	1.39	.82	.63	.51	.94	1.02

CAL YR 1967	TOTAL 189,665	MEAN 520	MAX 1,980	MIN 57	CFSM .871	IN 11.82
WTR YR 1968	TOTAL 177,073	MEAN 484	MAX 1,360	MIN 96	CFSM .811	IN 11.03

4-1325. Thunder Bay River near Hillman, Mich.

Location.--Lat 45°00'30", long 83°58'20", in NE 1/4 SE 1/4 sec.8, T.30 N., R.4 E., on left bank 25 ft upstream from bridge on State Highway 32, 0.4 mile downstream from Miller Creek, and 5.2 miles southwest of Hillman.

Drainage area.--232 sq mi.

Records available.--June 1945 to September 1968.

Gage.--Digital water-stage recorder. Altitude of gage is 760 ft (by barometer). Prior to Oct. 4, 1966, graphic water-stage recorder at same site and datum.

Average discharge.--23 years, 209 cfs.

Extremes.--Maximum discharge during year, 744 cfs Aug. 23 (gage height, 7.98 ft); minimum, 143 cfs Aug. 17, 18. 1945-68: Maximum discharge, 1,380 cfs Apr. 12, 1947 (gage height, 8.86 ft); maximum gage height, 9.63 ft May 11, 1963 (backwater from bridge repair); minimum daily discharge, 98 cfs Aug. 7, 1949.

Remarks.--Records good except those for the winter periods, which are poor. Prior to May 12, 1950, diurnal fluctuation below about 500 cfs by powerplant at Atlanta. Occasional regulation from dams above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	218	272	195	185	280	155	348	216	272	223	160	178
2	206	426	191	185	350	155	316	210	247	198	156	208
3	195	421	190	185	320	150	295	208	223	193	152	200
4	186	392	190	185	280	150	326	209	205	183	149	188
5	180	349	188	185	260	145	343	209	192	177	147	202
6	175	310	190	185	250	145	308	202	182	166	156	209
7	173	275	213	175	245	145	284	201	175	164	202	197
8	177	251	254	175	235	150	278	196	177	166	198	190
9	200	239	247	185	220	155	269	193	182	172	188	188
10	203	234	229	185	200	170	255	190	352	172	176	221
11	200	263	231	190	195	180	250	188	322	166	163	330
12	195	281	348	190	195	170	250	188	284	163	156	400
13	192	271	468	190	195	165	247	186	261	160	154	350
14	194	257	392	190	195	165	251	185	221	157	149	280
15	190	239	338	190	190	180	269	194	200	156	147	213
16	219	215	296	185	190	230	255	202	188	162	146	198
17	235	210	240	190	180	300	241	237	180	160	145	191
18	218	220	220	200	165	378	243	222	178	165	145	183
19	209	224	252	210	165	468	243	205	225	195	179	181
20	199	218	244	230	160	502	236	201	212	198	331	196
21	194	210	252	220	150	428	254	198	200	186	380	195
22	191	206	310	200	155	337	259	193	206	173	330	188
23	186	206	270	190	155	286	247	190	196	161	617	202
24	180	204	240	170	155	262	276	185	192	157	607	240
25	177	204	225	170	155	250	294	180	186	154	459	260
26	180	200	210	180	150	270	294	176	188	151	342	280
27	183	210	200	185	155	320	268	202	269	166	263	230
28	196	205	190	195	155	386	245	321	310	188	217	205
29	192	200	190	210	155	415	228	340	298	173	195	197
30	192	200	185	220	------	378	225	327	259	166	187	191
31	236	------	175	250	------	356	------	313	------	160	179	------
TOTAL	6,071	7,612	7,563	5,985	5,855	7,946	8,097	6,667	6,782	5,331	7,175	6,691
MEAN	196	254	244	193	202	256	270	215	226	172	231	223
MAX	236	426	468	250	350	502	348	340	352	223	617	400
MIN	173	200	175	170	150	145	225	176	175	151	145	178
CFSM	.84	1.09	1.05	.83	.87	1.10	1.16	.93	.97	.74	1.00	.96
IN.	.97	1.22	1.21	.96	.94	1.27	1.30	1.07	1.09	.85	1.15	1.07

CAL YR 1967	TOTAL 92,084	MEAN 252	MAX 903	MIN 143	CFSM 1.09	IN 14.76
WTR YR 1968	TOTAL 81,775	MEAN 223	MAX 617	MIN 145	CFSM .96	IN 13.11

PEAK DISCHARGE (BASE, 600 CFS)

DATE	TIME	G.HT.	DISCHARGE
08-23	1700	7.98	744

4-1335. Thunder Bay River near Bolton, Mich.

Location.--Lat 45°07'40", long 83°38'30", in NE 1/4 sec.36, T.32 N., R.6 E., on left bank half a mile upstream from Orchard Hill Bridge, 4 miles upstream from North Branch, 5 miles southwest of Bolton, and 11 miles northwest of Alpena.

Drainage area.--588 sq mi.

Records available.--March 1945 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 671.96 ft above mean sea level, unadjusted. Prior to Aug. 12, 1945, staff gage at site 500 ft downstream at different datum. Aug. 13, 1945, to Oct. 4, 1966, graphic water-stage recorder at same site and datum.

Average discharge.--23 years, 440 cfs.

Extremes.--Maximum discharge during year, 1,490 cfs Mar. 20 (gage height, 6.36 ft); maximum gage height, 6.77 ft Jan. 6 (backwater from ice); minimum discharge, 202 cfs Aug. 17.
1945-68: Maximum discharge, 4,070 cfs Apr. 13, 1965 (gage height, 9.99 ft); minimum, 92 cfs Sept. 28, 29, 1955.

Remarks.--Records good except those for the winter periods, which are poor. Regulation by Fletcher Pond on the Upper South Branch Thunder Bay River (usable capacity, 40,170 acre-ft).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	349	461	460	620	700	290	727	351	522	586	322	384
2	371	593	460	610	750	290	571	332	454	524	317	392
3	338	715	458	610	800	300	588	320	384	428	311	428
4	314	808	451	610	650	300	607	313	354	428	303	415
5	346	759	460	600	550	300	612	313	315	408	298	409
6	293	675	487	570	520	300	624	306	284	390	308	421
7	318	604	528	520	520	300	555	294	288	377	389	428
8	318	555	617	450	500	305	515	287	306	366	430	402
9	334	525	659	480	450	350	477	278	347	364	404	395
10	356	480	652	500	400	390	441	269	410	361	376	443
11	361	518	659	500	370	420	435	260	599	358	348	765
12	354	566	837	500	360	400	408	253	627	353	326	886
13	348	583	1,070	500	360	400	394	251	617	341	313	804
14	346	567	1,200	500	360	420	396	249	545	327	306	633
15	345	520	1,000	480	360	450	399	251	545	335	295	525
16	358	480	900	500	350	500	413	272	498	379	341	485
17	387	464	750	530	350	650	377	312	431	368	246	443
18	420	496	736	560	350	940	373	338	416	364	279	421
19	368	510	724	600	340	1,260	374	325	459	371	320	400
20	372	501	698	670	330	1,450	370	299	455	394	529	415
21	361	460	679	630	320	1,340	382	286	478	392	697	438
22	353	460	748	580	310	900	383	277	478	377	800	426
23	349	462	710	550	300	700	390	265	461	348	870	402
24	378	457	660	510	300	580	445	257	446	329	965	454
25	311	452	620	500	300	530	468	245	428	322	1,040	571
26	334	483	580	520	300	578	483	236	415	313	815	609
27	336	519	640	530	300	700	478	251	474	321	629	569
28	344	500	650	550	300	882	442	392	595	342	460	529
29	356	470	650	580	300	962	389	511	639	364	398	497
30	363	470	650	600	------	922	369	553	634	339	390	459
31	406	------	640	650	------	826	------	551	------	330	399	------
TOTAL	10,887	16,113	21,033	17,110	12,100	18,935	13,885	9,697	13,904	11,599	14,224	14,848
MEAN	351	537	678	552	417	611	463	313	463	374	459	495
MAX	420	808	1,200	670	800	1,450	727	553	639	586	1,040	886
MIN	293	452	451	450	300	290	369	236	284	313	246	384

CAL YR 1967 TOTAL 228,560 MEAN 626 MAX 3,530 MIN 263
WTR YR 1968 TOTAL 174,335 MEAN 476 MAX 1,450 MIN 236

4-1340. North Branch Thunder Bay River near Bolton, Mich.

Location.--Lat 45°08'55", long 83°36'35", in sec.29, T.32 N., R.7 E., on left bank 1 1/2 miles upstream from mouth, 2 1/2 miles south of Bolton, and 9 miles northwest of Alpena.

Drainage area.--184 sq mi.

Records available.--March 1945 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 675.52 ft above mean sea level, unadjusted. Prior to Aug. 16, 1945, staff gage at site half a mile upstream at different datum.

Average discharge.--23 years, 105 cfs.

Extremes.--1966-67: Maximum discharge during year, 2,390 cfs Apr. 2 (gage height, 7.27 ft); minimum, 0.6 cfs Oct. 11.

1967-68: Maximum discharge during year, 1,010 cfs Mar. 21 (gage height, 5.63 ft); maximum gage height, 6.18 ft Mar. 20 (backwater from ice); minimum discharge, 14 cfs July 14.

1945-68: Maximum discharge, 2,920 cfs Apr. 13, 1965 (gage height, 7.85 ft); maximum gage height, 7.98 ft Mar. 31, 1950 (ice jam); minimum discharge, 0.4 cfs Oct. 14, 1955.

Remarks.--Records good except those for the winter periods, which are poor. Occasional regulation during low flow from dams above station.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1966 TO SEPTEMBER 1967

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.2	38	190	80	280	90	1,680	210	60	93	40	31
2	1.2	35	220	78	250	90	2,200	207	56	88	39	29
3	1.2	31	300	78	220	90	2,060	204	53	95	37	27
4	1.2	30	500	76	200	90	1,890	219	50	93	36	26
5	1.0	29	440	76	180	90	1,640	231	47	90	36	24
6	1.5	29	380	75	160	90	1,410	219	46	90	36	22
7	1.5	28	357	75	150	90	1,160	192	46	85	39	22
8	1.3	38	414	76	140	90	1,080	168	54	76	39	22
9	1.2	42	470	80	130	90	941	148	63	70	40	22
10	2.2	45	550	82	120	90	927	136	74	65	41	22
11	0.9	56	600	88	115	90	983	136	204	60	39	24
12	1.5	57	500	92	110	92	824	150	192	56	37	25
13	2.2	57	310	96	105	92	645	171	432	52	34	26
14	2.8	55	250	98	100	94	520	189	872	50	32	22
15	5.2	52	200	100	100	95	472	192	1,500	48	28	20
16	7.5	48	170	100	100	95	476	177	1,270	46	27	18
17	6.5	46	150	100	100	98	496	156	969	43	25	16
18	9.5	44	130	100	100	98	476	136	920	56	24	15
19	14	42	120	100	98	100	440	128	690	73	24	14
20	15	38	110	105	98	100	388	124	496	93	22	11
21	13	35	105	110	96	100	356	124	380	120	21	12
22	11	34	100	115	96	105	388	122	305	145	21	17
23	9.0	32	95	120	96	105	424	114	258	133	21	19
24	7.5	34	90	125	95	115	496	104	222	106	20	25
25	7.5	47	85	150	95	120	480	95	192	88	20	27
26	8.5	52	80	180	94	140	396	88	159	78	19	29
27	8.5	73	80	300	92	170	333	82	136	70	20	29
28	9.5	100	80	350	90	200	280	78	122	64	29	29
29	23	130	80	330	------	250	249	73	112	58	24	33
30	34	150	80	310	------	350	225	68	102	52	27	36
31	37	------	80	300	------	550	------	63	------	46	30	------
TOTAL	247.1	1527	7316	4145	3610	4059	24335	4504	10082	2382	927	694
MEAN	7.97	50.9	236	134	129	131	811	145	336	76.8	29.9	23.1
MAX	37	150	600	350	280	550	2200	231	1500	145	41	36
MIN	.9	28	80	75	90	90	225	63	46	43	19	11
CFSM	.043	.277	1.28	.728	.701	.712	4.41	.788	1.83	.417	.162	.126
IN	.05	.31	1.48	.84	.73	.82	4.92	.91	2.04	.48	.19	.14

CAL YR	1966	TOTAL	32,670.1	MEAN	89.5	MAX	625	MIN	.7	CFSM	.486	IN 6.60
WTR YR	1967	TOTAL	63,828.1	MEAN	175	MAX	2,200	MIN	.9	CFSM	.951	IN 12.90

PEAK DISCHARGE (BASE, 500 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-04	1200	5.78	550	04-11	1030	5.62	1,000
12-11	0200	5.42	660	06-15	1530	6.30	1,540
04-02	2200	7.27	2,390				

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	36	56	105	90	140	40	384	138	162	82	27	72
2	36	82	105	85	180	40	326	124	165	74	25	69
3	36	108	105	75	220	41	288	112	153	64	24	64
4	38	140	101	75	200	43	277	102	131	55	24	63
5	34	177	104	75	170	45	267	97	110	48	21	65
6	32	189	101	75	150	45	258	90	90	41	20	64
7	29	186	101	75	140	45	252	84	78	36	22	61
8	31	174	105	75	140	45	240	79	66	32	27	59
9	31	159	110	75	140	48	216	73	63	30	31	59
10	31	140	130	75	140	55	198	69	63	27	32	74
11	31	143	160	78	140	60	180	65	61	24	30	195
12	31	148	180	77	120	60	168	63	56	22	28	219
13	32	155	200	76	100	56	153	58	55	20	26	252
14	32	170	240	75	90	57	143	55	53	18	24	277
15	32	190	300	75	80	65	140	54	50	18	21	249
16	34	170	250	75	70	85	138	56	47	18	20	183
17	34	130	200	77	65	130	131	63	44	17	18	126
18	36	143	160	83	63	250	131	73	40	30	17	97
19	36	162	140	90	60	350	131	86	41	38	26	80
20	43	165	120	120	55	650	138	90	39	36	91	76
21	44	150	120	115	52	914	145	82	41	33	195	76
22	38	135	120	100	50	836	145	72	45	31	488	79
23	36	138	115	95	46	550	145	65	48	25	555	79
24	38	131	115	95	44	450	156	59	49	23	476	85
25	38	120	115	90	43	350	168	54	46	21	400	92
26	36	124	115	90	42	352	183	48	43	21	440	93
27	36	126	110	90	41	368	198	50	49	26	388	97
28	36	125	100	95	41	460	198	78	55	28	280	93
29	36	110	95	100	41	600	183	101	69	28	195	85
30	38	110	95	110	------	560	165	131	80	28	122	76
31	45	------	90	120	------	476	------	150	------	28	88	------
TOTAL	1,096	4,256	4,207	2,701	2,863	8,126	5,845	2,521	2,092	1,022	4,181	3,259
MEAN	35.4	142	136	87.1	98.7	262	195	81.3	69.7	33.0	135	109
MAX	45	190	300	120	220	914	384	150	165	82	555	277
MIN	29	56	90	75	41	40	131	48	39	17	17	59
CFSM	.192	.772	.739	.473	.536	1.42	1.06	.442	.379	.179	.734	.592
IN	.22	.86	.85	.55	.58	1.64	1.18	.51	.42	.21	.85	.66

CAL YR	1967	TOTAL	64,297	MEAN	176	MAX	2,200	MIN	11	CFSM	.957	IN	13.00
WTR YR	1968	TOTAL	42,169	MEAN	115	MAX	914	MIN	17	CFSM	.625	IN	8.52

PEAK DISCHARGE (BASE, 500 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
03-21	2000	5.63	1,010	08-23	0300	4.87	585
03-29	2000	4.98	615				

4-1355. Au Sable River at Grayling, Mich.

Location.--Lat 44°39'35", long 84°42'45", in SE 1/4 sec.7, T.26 N., R.3 W., on right bank 65 ft upstream from bridge on Interstate Highway 75 (Business Loop) at Grayling, three-quarters of a mile upstream from East Branch, and 114 miles upstream from mouth.

Drainage area.--110 sq mi.

Records available.--October 1942 to September 1968. Prior to October 1954, published as Middle Branch Au Sable River at Grayling. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Water-stage recorder above steel-crested dam. Datum of gage is 1,123.49 ft above mean sea level, datum of 1929.

Average discharge.--26 years, 73.3 cfs.

Extremes.--Maximum discharge during year, 116 cfs Mar. 29 (gage height, 1.76 ft); minimum, 51 cfs Aug. 15.
1942-68: Maximum discharge, 274 cfs June 2, 1943 (gage height, 3.00 ft); minimum, 28 cfs Apr. 21, 1946.

Remarks.--Records good. Prior to Dec. 31, 1952 diurnal fluctuation caused by powerplant 2.5 miles above station. Records of water temperatures for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	69	85	81	79	86	62	102	75	77	86	61	59
2	66	105	80	78	102	65	97	73	74	75	61	61
3	63	113	79	79	89	61	93	72	72	71	59	62
4	61	109	78	79	85	65	99	73	69	69	57	61
5	58	103	78	77	96	68	103	74	67	69	56	68
6	55	98	78	77	93	67	102	73	64	67	57	71
7	55	93	80	77	90	65	96	71	62	65	56	69
8	55	89	84	75	86	68	91	69	62	66	55	67
9	59	85	85	77	80	72	87	68	64	77	55	66
10	61	87	84	77	70	75	87	68	71	87	55	72
11	62	98	84	77	72	75	86	68	67	87	55	80
12	61	109	95	77	77	69	83	69	68	79	54	80
13	60	111	105	77	72	58	80	75	67	73	53	78
14	61	104	109	77	73	62	84	75	66	69	53	72
15	61	97	99	78	73	73	86	78	64	66	52	66
16	68	85	93	75	71	74	87	79	62	64	52	63
17	69	90	89	74	65	78	85	81	60	62	55	61
18	67	91	89	77	64	83	85	78	61	69	53	61
19	65	91	89	78	64	96	83	74	71	75	67	62
20	64	89	87	80	62	110	83	73	73	73	77	69
21	64	86	90	81	62	113	85	71	71	67	77	71
22	63	84	98	81	64	103	84	69	69	64	72	69
23	62	83	97	79	64	98	85	67	65	61	69	67
24	61	83	93	64	66	95	87	66	65	60	67	69
25	61	81	97	67	64	92	90	64	75	59	64	71
26	62	87	89	71	63	93	90	63	75	61	64	71
27	66	90	79	71	64	101	86	69	93	65	64	69
28	66	86	80	71	67	107	81	84	107	71	62	67
29	66	78	80	75	67	113	79	92	110	71	62	65
30	67	84	80	81	------	110	77	90	99	65	60	65
31	77	------	84	81	------	104	------	81	------	63	60	------
TOTAL	1,955	2,774	2,713	2,367	2,151	2,575	2,643	2,282	2,170	2,156	1,864	2,032
MEAN	63.1	92.5	87.5	76.4	74.2	83.1	88.1	73.6	72.3	69.5	60.1	67.7
MAX	77	113	109	81	102	113	103	92	110	87	77	80
MIN	55	78	78	64	62	58	77	63	60	59	52	59
CFSM	.574	.841	.795	.695	.675	.755	.801	.669	.657	.632	.546	.615
IN	.66	.94	.92	.80	.73	.87	.89	.77	.73	.73	.63	.69

CAL YR	1967	TOTAL	29,835	MEAN	81.7	MAX	179	MIN	54	CFSM	.743	IN 10.09
WTR YR	1968	TOTAL	27,682	MEAN	75.6	MAX	113	MIN	52	CFSM	.687	IN 9.36

4-1356. East Branch Au Sable River at Grayling, Mich.

Location.--Lat 44°40'10", long 84°42'20", in NW 1/4 NW 1/4 sec.8, T.26 N., R.3 W., on right bank at south boundary of State research center at Grayling and 0.4 mile upstream from mouth.

Drainage area.--76.0 sq mi.

Records available.--April 1958 to September 1968.

Gage.--Digital water-stage recorder. Altitude of gage is 1,110 ft (from topographic map). Prior to Sept. 30, 1958, staff gage at site 10 ft downstream at same datum.

Average discharge.--10 years, 41.1 cfs.

Extremes.--Maximum discharge during year, 74 cfs Mar 20 (gage height, 3.81 ft); minimum, 28 cfs Aug. 17; minimum daily, 29 cfs Aug. 15, 16, 18.

1958-68: Maximum discharge, 140 cfs Apr. 2, 1967 (gage height, 4.53 ft); maximum gage height, 4.67 ft Apr. 14, 1960; minimum discharge, 7.0 cfs Mar. 27, 1965, result of freeze-up; minimum daily discharge, 16 cfs Aug. 20, 1964.

Remarks.--Records good except those for periods of no gage-height record, which are fair. Occasional regulation by State research center above gage.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	40	49	45	42	52	33	64	47	50	48	36	32
2	39	60	44	42	54	33	61	46	49	46	34	35
3	38	59	44	43	48	33	60	46	47	44	33	34
4	38	57	43	43	45	34	66	47	45	42	33	33
5	37	55	43	43	50	35	65	46	44	42	32	42
6	37	52	43	43	47	35	62	45	43	40	33	42
7	36	50	46	43	46	35	60	44	42	38	33	39
8	37	49	48	42	44	39	59	44	42	41	33	38
9	38	48	47	45	40	40	58	44	46	48	32	37
10	38	49	46	44	36	41	57	43	51	47	32	43
11	38	58	47	44	37	42	56	43	51	45	31	49
12	38	60	56	44	38	42	55	45	48	43	31	43
13	38	60	56	44	38	39	55	49	46	41	31	40
14	39	56	53	44	38	42	55	48	43	39	30	38
15	38	52	51	44	38	47	57	49	42	38	29	36
16	42	50	49	43	36	48	54	49	40	37	29	35
17	41	50	48	42	33	53	53	54	39	36	30	34
18	40	50	48	44	34	58	54	50	41	44	29	33
19	39	50	48	45	34	66	53	47	49	45	39	34
20	39	49	47	45	33	71	52	46	45	41	40	39
21	39	48	50	45	33	67	55	45	44	40	37	36
22	38	48	55	45	34	63	53	44	44	38	35	35
23	38	47	49	42	35	60	53	43	42	37	37	36
24	38	47	51	40	35	58	57	42	42	37	36	39
25	38	47	49	39	35	58	56	41	44	35	34	38
26	39	50	41	40	34	61	54	40	47	34	34	36
27	39	49	40	40	34	63	52	49	61	42	34	36
28	39	47	42	40	34	68	50	61	61	42	32	35
29	39	45	42	43	34	69	49	59	57	39	32	34
30	40	44	42	45	------	66	48	56	52	37	32	34
31	46	------	42	46	------	66	------	53	------	36	31	------
TOTAL	1,203	1,535	1,455	1,334	1,129	1,565	1,683	1,465	1,397	1,262	1,024	1,115
MEAN	38.8	51.2	46.9	43.0	38.9	50.5	56.1	47.3	46.6	40.7	33.0	37.2
MAX	46	60	56	46	54	71	66	61	61	48	40	49
MIN	36	44	40	39	33	33	48	40	39	34	29	32
CFSM	.51	.67	.62	.57	.51	.66	.74	.62	.61	.54	.43	.49
IN.	.59	.75	.71	.65	.55	.77	.82	.72	.68	.62	.50	.55

CAL YR 1967	TOTAL 17,678	MEAN 48.4	MAX 134	MIN 33	CFSM .64	IN 8.65
WTR YR 1968	TOTAL 16,167	MEAN 44.2	MAX 71	MIN 29	CFSM .58	IN 7.91

Note.--No gage-height record Dec. 29 to Mar. 7.

4-1357. South Branch AuSable River near Luzerne, Mich.

Location.--Lat 44°36'53", long 84°27'20", in SE 1/4 SE 1/4 sec.29, T.26 N., R.1 W., on right bank 10 ft upstream from Smith Bridge, 400 ft downstream from highway bridge on State Highway 72, 4.6 miles upstream from mouth, and 9.1 miles west of Luzerne.

Drainage area.--401 sq mi.

Records available.--October 1966 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 1070 ft (from topographic map).

Extremes.--Maximum discharge during year, 322 cfs June 30 (gage height, 5.18 ft); minimum, 105 cfs Feb. 26. 1966-68: Maximum discharge, 654 cfs Apr. 2, 1967 (gage height, 6.07 ft); minimum daily, 105 cfs Oct. 7-9, Nov. 3, 1966.

Remarks.--Records good. Occasional regulation by dams above station. Records of water temperatures for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	168	225	205	210	208	130	298	240	262	290	140	118
2	168	278	208	210	265	135	290	238	250	262	138	125
3	168	278	202	200	230	140	282	232	232	242	132	128
4	162	280	200	188	220	145	292	230	228	222	130	128
5	160	285	200	188	215	152	290	225	222	212	128	138
6	160	275	202	180	210	155	288	222	195	192	128	138
7	155	262	210	175	200	155	282	218	198	182	130	138
8	160	250	238	170	200	155	270	215	205	175	128	132
9	170	240	238	170	190	165	260	212	198	175	125	135
10	178	235	238	170	170	182	255	210	190	172	125	155
11	180	258	235	170	165	182	252	205	190	168	120	172
12	178	265	280	170	170	175	250	200	190	165	118	172
13	175	265	290	165	170	172	245	208	188	158	118	160
14	180	265	268	160	170	158	250	210	185	152	115	145
15	178	258	260	160	170	172	252	208	180	150	112	138
16	198	228	250	165	165	190	258	210	165	152	112	132
17	202	232	250	168	160	215	258	220	155	150	112	128
18	200	232	255	165	150	248	258	215	160	172	110	125
19	200	240	255	168	150	280	250	212	198	198	132	130
20	192	232	238	170	150	315	248	218	185	188	155	148
21	185	225	258	172	140	312	265	220	185	180	155	150
22	180	222	278	172	140	288	262	220	180	165	145	145
23	178	220	240	175	140	245	268	228	162	152	135	138
24	188	215	235	160	140	195	280	230	160	148	125	158
25	188	212	240	150	130	208	280	218	190	142	122	178
26	182	230	222	158	130	220	280	218	212	138	120	180
27	180	230	220	160	130	252	275	228	278	152	118	172
28	185	220	215	162	140	285	265	275	310	160	118	160
29	185	180	215	168	148	300	252	305	320	152	118	155
30	192	208	215	180	------	302	250	300	310	145	115	148
31	212	------	220	180	------	302	------	285	------	138	112	------
TOTAL	5.587	7.245	7.280	5.359	4.966	6.530	8.005	7.075	6.283	5.449	3.891	4.369
MEAN	180	242	235	173	171	211	267	228	209	176	126	146
MAX	212	285	290	210	265	315	298	305	320	290	155	180
MIN	155	180	200	150	130	130	245	200	155	138	110	118
CFSM	.449	.603	.586	.431	.426	.526	.666	.569	.521	.439	.314	.364
IN	.52	.67	.68	.50	.46	.61	.74	.66	.58	.51	.36	.41

CAL YR	1967	TOTAL	89,763	MEAN	246	MAX	648	MIN	115	CFSM	.613	IN 8.32
WTR YR	1968	TOTAL	72,039	MEAN	197	MAX	320	MIN	110	CFSM	.491	IN 6.68

4-1365. Au Sable River at Mio, Mich.

Location.--Lat 44°39'35", long 84°07'30", on line between sec.7, T.26 N., R.3 E., and sec.12, T.26 N., R.2 E., on right bank 150 ft upstream from bridge on State Highway 33 at Mio, and 10 miles downstream from Big Creek, and 73.0 miles upstream from mouth.

Drainage area.--1,100 sq mi, approximately

Records available.--July 1952 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 929.60 ft above mean sea level, datum of 1929. Prior to Apr. 17, 1964, graphic water-stage recorder at same site and datum.

Average discharge.--16 years, 930 cfs.

Extremes.--Maximum discharge during year, 2,760 cfs Nov. 13, 16; maximum gage height, 4.89 ft Nov. 13; minimum discharge, 23 cfs Oct. 26 (gage height, 0.25 ft); minimum daily discharge, 689 cfs Aug. 16.
1952-68: Maximum discharge, 3,450 cfs Oct. 3, 1961 (gage height, 5.52 ft); minimum, 18 cfs Sept. 18, 19, 20, 21, 28, 1962 (gage height, 0.10 ft); minimum daily, 456 cfs Feb. 17, 1958.

Remarks.--Records good. Flow regulated at all stages by powerplant 500 ft above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	952	1,200	1,070	961	1,140	914	1,400	1,000	1,150	1,200	767	748
2	921	1,460	954	922	1,540	894	1,340	989	1,090	1,040	795	779
3	903	1,610	963	1,050	1,280	883	1,200	986	1,050	958	769	827
4	869	1,370	1,050	917	1,010	878	1,270	978	999	936	931	798
5	858	1,310	1,000	925	1,010	926	1,320	981	968	936	769	797
6	796	1,320	1,000	907	1,170	956	1,270	956	960	936	757	842
7	815	1,100	1,010	837	1,160	949	1,220	928	922	898	758	863
8	830	1,090	1,190	864	1,030	948	1,200	900	1,010	862	762	871
9	882	1,110	1,160	819	983	948	1,180	900	1,010	854	763	847
10	816	1,120	1,020	824	731	1,020	1,150	904	1,170	885	761	914
11	938	1,320	1,160	957	691	1,040	1,130	905	1,230	916	759	1,150
12	862	1,300	1,320	907	798	1,010	1,090	920	1,200	911	740	1,160
13	881	1,350	1,630	897	839	945	1,070	892	1,120	904	736	1,030
14	931	1,190	1,260	931	942	917	1,070	908	970	880	729	911
15	937	1,180	1,180	954	980	939	1,110	953	919	859	705	871
16	1,010	1,100	1,100	897	966	1,060	1,120	969	890	842	689	821
17	1,000	1,060	1,180	917	938	1,160	1,110	1,030	872	816	732	772
18	964	1,120	1,220	926	753	1,210	1,100	1,060	875	855	750	799
19	942	1,100	1,110	972	837	1,340	1,100	1,020	1,010	1,000	884	806
20	948	1,180	1,130	971	922	1,760	1,070	1,090	1,120	998	1,010	869
21	923	1,070	1,090	947	872	1,390	1,130	938	1,050	901	938	852
22	870	1,050	1,160	938	877	1,290	1,180	929	1,020	882	800	870
23	859	949	1,220	963	924	1,280	1,140	972	1,000	857	894	871
24	963	1,110	1,120	788	896	1,190	1,160	971	956	835	845	895
25	1,050	987	1,080	761	883	1,110	1,220	954	974	816	829	974
26	949	1,020	1,130	921	920	1,130	1,220	908	1,000	798	770	996
27	718	1,320	795	938	937	1,220	1,130	955	1,590	801	727	938
28	885	1,080	692	934	929	1,360	1,100	1,190	1,430	905	733	888
29	931	967	787	935	929	1,510	1,050	1,580	1,410	905	739	881
30	933	1,000	871	937	------	1,400	1,050	1,340	1,300	832	745	843
31	980	------	1,090	960	------	1,380	------	1,220	------	782	743	------
TOTAL	28,116	35,143	33,742	28,375	27,887	34,957	34,900	31,226	32,265	27,800	24,329	26,483
MEAN	907	1,171	1,088	915	962	1,128	1,163	1,007	1,076	897	785	883
MAX	1,050	1,610	1,630	1,050	1,540	1,760	1,400	1,580	1,590	1,200	1,010	1,160
MIN	718	949	692	761	691	878	1,050	892	872	782	689	748
CFSM	.82	1.06	.99	.83	.87	1.03	1.06	.92	.98	.82	.71	.80
IN.	.95	1.19	1.14	.96	.94	1.18	1.18	1.06	1.09	.94	.82	.90

CAL YR 1967 TOTAL 408,554 MEAN 1,119 MAX 2,620 MIN 653 CFSM 1.02 IN 13.81
WTR YR 1968 TOTAL 365,223 MEAN 998 MAX 1,760 MIN 689 CFSM .91 IN 12.35

GPO 817-436-11

4-1380. East Branch Au Gres River at McIvor, Mich.

Location.--Lat 44°14'20", long 83°41'50", on line between secs.3 and 10, T.21 N., R.6 E., on right bank 25 ft downstream from highway bridge at McIvor, 1.1 miles east of National City, and 9 miles southwest of Tawas City.

Drainage area.--84 sq mi, approximately.

Records available.--October 1950 to September 1968. Monthly discharge only for October, November 1950, published in WSP 1727.

Gage.--Digital water-stage recorder. Datum of gage is 646.58 ft above mean sea level, datum of 1929. Prior to Aug. 30, 1951, wire-weight gage at site 25 ft upstream at same datum. Aug. 31, 1951, to Oct. 20, 1966, graphic water-stage recorder at present site and datum.

Average discharge.--18 years, 62.6 cfs.

Extremes.--Maximum discharge during year, 825 cfs May 28 (gage height, 7.60 ft); minimum, 24 cfs Feb. 13 (discharge measurement).
1950-68: Maximum discharge, 1,310 cfs May 20, 1959 (gage height, 8.88 ft); minimum, 16 cfs Dec. 4, 1952; minimum daily, 22 cfs June 20, 21, 26-28, July 6, 7, July 30 to Aug. 1, Sept. 7, 1964.

Remarks.--Records good except those for the winter periods, which are fair. Some intermittent regulation since 1952 and prior to 1966 at low and medium flow by dam 2 1/2 miles above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	43	49	36	39	110	29	91	69	137	71	43	34
2	39	84	35	40	310	29	83	65	128	64	39	42
3	37	59	35	40	200	29	79	63	115	60	37	37
4	35	59	35	41	150	29	94	66	105	58	36	34
5	35	51	34	41	100	29	118	62	97	82	40	35
6	34	46	37	41	65	29	94	55	89	66	71	34
7	33	43	57	40	50	29	83	54	84	58	49	35
8	39	41	71	39	45	35	79	54	84	55	43	36
9	43	41	53	39	43	50	77	53	78	79	41	38
10	40	41	46	39	37	75	73	50	78	75	52	69
11	38	61	49	40	31	65	79	49	79	62	40	66
12	37	64	192	40	26	56	75	48	80	57	37	47
13	36	54	166	40	28	52	76	77	74	53	37	42
14	40	48	91	40	29	45	79	72	8	50	36	39
15	38	46	70	41	29	50	95	74	65	48	35	38
16	79	43	58	41	28	55	82	79	62	46	36	37
17	58	41	54	42	28	60	78	86	59	44	41	36
18	46	41	50	42	28	62	87	73	59	44	36	35
19	42	40	50	42	28	67	85	69	70	48	56	41
20	40	39	48	43	28	70	79	76	61	43	63	68
21	39	37	52	42	28	69	91	77	62	42	42	50
22	38	38	59	42	28	62	85	96	67	41	39	45
23	38	39	56	42	29	57	82	97	61	40	41	44
24	37	38	50	41	29	56	134	78	68	41	38	52
25	38	37	43	40	29	54	118	65	80	39	35	55
26	37	39	41	40	29	99	104	59	81	38	35	44
27	42	37	41	40	29	135	92	224	121	41	35	45
28	49	37	40	40	29	117	83	711	104	43	34	42
29	44	37	40	47	29	104	73	352	88	39	34	40
30	44	36	40	70	------	91	75	221	79	38	34	39
31	45	------	38	55	------	89	------	163	------	39	34	------
TOTAL	1,283	1,366	1,767	1,309	1,652	1,878	2,623	3,437	2,483	1,604	1,269	1,299
MEAN	41.4	45.5	57.0	42.2	57.0	60.6	87.4	111	82.8	51.7	40.9	43.3
MAX	79	84	192	70	310	135	134	711	137	82	71	69
MIN	33	36	34	39	26	29	73	48	59	38	34	34
CFSM	.49	.54	.68	.50	.68	.72	1.04	1.32	.99	.62	.49	.52
IN.	.57	.60	.78	.58	.73	.83	1.16	1.52	1.10	.71	.56	.58

CAL YR 1967 TOTAL 25,419 MEAN 69.6 MAX 524 MIN 33 CFSM .83 IN 11.25
WTR YR 1968 TOTAL 21,970 MEAN 60.0 MAX 711 MIN 26 CFSM .71 IN 9.73

PEAK DISCHARGE (BASE, 300 CFS)

DATE	TIME	G.HT.	DISHCARGE	DATE	TIME	G.HT.	DISCHARGE
02-02	1500	6.98	420	05-28	1100	7.60	825

4-1385. Au Gres River near National City, Mich.

Location.--Lat 44°10'45", long 83°44'15", in NW 1/4 sec.32, T.21 N., R.6 E., on left bank 20 ft downstream from highway bridge, 1 1/2 miles upstream from Elm Creek, 4 miles southwest of National City, 12 1/2 miles southwest of Tawas City, and 15 1/2 miles upstream from mouth.

Drainage area.--169 sq mi.

Records available.--October 1950 to September 1968. Monthly discharge only for October, November 1950, published in WSP 1727.

Gage.--Water-stage recorder. Altitude of gage is 710 ft (by barometer). Prior to Oct. 1, 1951, wire-weight gage at site 1.7 miles upstream at different datum.

Average discharge.--18 years, 93.6 cfs.

Extremes.--Maximum discharge during year, 1,830 cfs May 28 (gage height, 7.02 ft); maximum gage height, 9.07 ft Feb. 21 (backwater from ice); minimum discharge, 11 cfs Oct. 6.
1950-68: Maximum discharge, 1,970 cfs Apr. 4, 1959 (gage height, 7.87 ft); maximum gage height, 10.5 ft Feb. 21, 1953 (ice jam); minimum discharge, 5.9 cfs Nov. 3, 1966, result of freeze-up.

Remarks.--Records fair.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	32	45	53	47	250	46	202	122	260	110	29	18
2	25	106	49	46	480	46	180	110	225	78	26	21
3	21	95	53	46	300	46	180	105	185	57	22	24
4	20	110	51	46	250	47	266	100	152	52	21	20
5	18	93	49	46	180	47	372	92	130	82	35	19
6	12	78	51	46	130	47	262	82	112	82	59	18
7	17	72	99	46	100	48	215	73	100	69	41	18
8	21	68	142	45	80	54	180	69	110	59	32	18
9	29	68	95	45	65	80	165	80	112	71	29	22
10	32	68	78	45	58	180	155	78	105	130	26	49
11	25	93	82	45	52	160	150	61	95	85	24	57
12	22	115	410	46	45	120	148	55	108	65	21	31
13	21	99	462	46	43	100	138	110	102	52	21	27
14	25	86	170	47	44	94	138	102	88	45	19	24
15	25	84	130	47	46	92	182	122	82	39	18	21
16	58	80	100	48	46	100	162	125	80	37	19	20
17	55	70	90	48	46	105	145	162	69	35	25	19
18	33	70	84	48	46	115	160	132	67	34	24	19
19	27	72	80	49	46	120	160	112	73	38	24	26
20	24	66	80	49	46	132	148	125	65	34	34	41
21	22	62	80	48	46	125	182	120	57	32	22	34
22	21	60	92	48	46	108	172	150	67	31	20	29
23	20	62	85	47	46	90	170	155	57	27	19	41
24	20	60	75	47	46	88	300	118	67	28	18	35
25	20	60	66	47	46	82	268	90	128	27	17	49
26	20	62	64	46	46	332	222	75	142	25	17	34
27	24	60	60	46	46	538	185	415	242	26	17	30
28	42	60	58	47	46	366	162	1,640	222	31	17	30
29	38	60	54	60	46	282	138	1,240	180	26	17	27
30	37	56	52	100	------	238	138	657	142	22	19	24
31	42	------	48	70	------	208	------	404	------	22	19	------
TOTAL	848	2,240	3,142	1,537*	2,767	4,236	5,645	7,081	3,624	1,551	751	845
MEAN	27.4	74.7	101	49.6	95.4	137	188	228	121	50.0	24.2	28.2
MAX	58	115	462	100	480	538	372	1,640	260	130	59	57
MIN	12	45	48	45	43	46	138	55	57	22	17	18
CFSM	.162	.442	.598	.293	.564	.811	1.11	1.35	.716	.296	.143	.167
IN	.19	.49	.69	.34	.61	.93	1.24	1.56	.80	.34	.17	.19

CAL YR	1967	TOTAL	40,077	MEAN	110	MAX	1,650	MIN	12	CFSM	.651	IN 8.82
WTR YR	1968	TOTAL	34,267	MEAN	93.6	MAX	1,640	MIN	12	CFSM	.554	IN 7.54

PEAK DISCHARGE (BASE, 600 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-13	0300	3.67	625	03-26	2300	3.70	720
02-02	1830	9.07	600	05-28	1700	7.02	1,830

4-1390. Houghton Creek near Lupton, Mich.

Location.--Lat 44°23'50", long 84°02'55", in SE 1/4 sec.10, T.23 N., R.3 E., on right bank half a mile upstream from mouth, 3 miles downstream from Wilkins Creek, and 3 miles southwest of Lupton.

Drainage area.--29.7 sq mi.

Records available.--July 1950 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 864.55 ft above mean sea level, datum of 1929.

Average discharge.--18 years, 50.8 cfs.

Extremes.--Maximum discharge during year, 226 cfs May 28 (gage height, 4.78 ft); minimum, 34 cfs Aug. 15, 27. 1950-68: Maximum discharge, 955 cfs May 20, 1959 (gage height, 7.15 ft), from rating curve extended above 400 cfs on basis of slope-area measurement of peak flow; minimum, 28 cfs Feb. 1, 1953, result of freeze-up.

Remarks.--Records good. Intermittent regulation at low flow by sawmill on Sandback Creek at Rose City prior to June 1955 and since November 1958. Records of water temperatures for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	42	50	44	42	80	47	64	48	52	46	38	36
2	40	69	44	45	173	47	56	48	56	44	38	46
3	40	56	44	45	95	47	56	48	50	42	38	38
4	40	53	44	45	58	48	68	48	48	41	38	37
5	39	49	44	45	56	48	70	48	45	46	38	39
6	39	48	45	45	55	48	58	47	44	43	46	37
7	40	47	54	44	56	48	56	46	45	41	39	36
8	42	46	70	42	52	57	55	46	48	41	38	37
9	44	46	52	43	47	68	54	46	44	47	37	39
10	44	46	49	44	40	71	54	45	44	44	37	66
11	42	53	51	45	34	58	55	45	45	41	36	97
12	42	54	109	45	37	54	54	45	44	40	36	48
13	41	49	122	46	39	52	54	46	43	40	36	40
14	42	48	68	46	40	49	56	47	42	40	35	38
15	42	46	58	46	40	50	76	47	42	40	34	38
16	52	45	55	47	40	56	59	49	42	40	36	38
17	48	45	54	48	40	58	56	51	42	40	36	40
18	45	47	54	49	40	58	58	47	42	40	36	37
19	44	47	56	49	40	60	56	47	48	42	46	39
20	43	46	54	49	42	68	54	49	43	40	46	48
21	43	45	56	49	43	56	63	47	43	40	37	44
22	43	45	67	49	44	52	57	46	47	39	36	41
23	43	46	54	48	45	51	56	46	44	38	36	41
24	43	46	52	47	46	51	66	45	44	39	36	42
25	43	45	52	47	46	54	62	44	45	38	37	45
26	43	48	52	48	47	88	56	44	46	38	35	42
27	44	46	51	48	47	88	52	77	64	40	34	44
28	45	45	49	49	47	74	50	200	54	40	37	43
29	44	44	49	51	47	68	49	138	48	38	35	42
30	48	44	48	59	------	61	50	76	48	38	35	42
31	52	------	46	52	------	61	------	60	------	38	35	------
TOTAL	1342	1444	1747	1457	1516	1796	1730	1766	1392	1264	1157	1300
MEAN	43.3	48.1	56.4	47.0	52.3	57.9	57.7	57.0	46.4	40.8	37.3	43.3
MAX	52	69	122	59	173	88	76	200	64	47	46	97
MIN	39	44	44	42	34	47	49	44	42	38	34	36
CFSM	1.46	1.62	1.90	1.58	1.76	1.95	1.94	1.92	1.56	1.37	1.26	1.46
IN	1.68	1.81	2.19	1.82	1.90	2.25	2.17	2.21	1.74	1.58	1.45	1.63

CAL YR	1967	TOTAL	20,128	MEAN	55.1	MAX	222	MIN	36	CFSM	1.86	IN	25.20
WTR YR	1968	TOTAL	17,911	MEAN	48.9	MAX	200	MIN	34	CFSM	1.65	IN	22.43

PEAK DISCHARGE (BASE, 180 CFS)

DATE	TIME	G.HT.	DISCHARGE
02-02	1700	4.46	206
05-28	1730	4.78	226

4-1395. Rifle River at "The Ranch" near Lupton, Mich.

Location.--Lat 44°23'35", long 84°02'15", in SW 1/4 sec.11, T.23 N., R.3 E., on left bank a quarter of a mile downstream from Houghton Creek and 3 miles southwest of Lupton.

Drainage area.--56.8 sq mi, approximately.

Records available.--July 1950 to September 1968.

Gage.--Water-stage recorder and wooden control. Datum of gage is 857.47 ft above mean sea level, datum of 1929.

Average discharge.--18 years, 90.5 cfs.

Extremes.--Maximum discharge during year, 388 cfs May 28 (gage height, 9.05 ft); minimum, 48 cfs Mar. 3, result of freeze-up.

1950-68: Maximum discharge, 1,330 cfs May 20, 1959 (gage height, 10.10 ft); minimum, 48 cfs Oct. 8, 1952, Mar. 3, 1968.

Remarks.--Records good. Occasional regulation by dams above station. Records of water temperatures for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	77	97	75	76	135	75	130	94	122	91	65	65
2	72	137	75	72	295	76	115	91	118	80	63	89
3	69	118	76	76	180	76	111	89	103	75	63	75
4	68	110	75	78	140	79	132	90	91	74	62	70
5	66	99	74	80	126	81	145	88	83	84	65	75
6	66	91	77	78	115	77	123	84	78	77	86	72
7	65	87	96	76	113	77	113	83	81	72	78	68
8	70	84	131	74	100	90	108	83	92	70	75	70
9	80	84	103	74	90	113	104	84	84	84	70	74
10	81	84	94	76	80	127	102	82	80	79	66	131
11	76	98	97	78	70	112	102	81	79	73	63	182
12	74	106	187	80	74	103	99	81	77	70	62	116
13	72	97	218	80	76	94	97	84	74	70	62	98
14	75	92	144	80	76	89	104	86	70	68	61	89
15	73	86	118	80	76	88	142	91	68	68	60	84
16	101	80	106	82	72	99	118	96	66	66	63	82
17	96	82	100	84	70	107	110	106	65	66	65	80
18	86	86	100	84	70	110	114	96	67	67	63	75
19	80	86	106	84	72	118	110	95	83	69	90	78
20	77	84	100	84	74	135	104	100	72	66	96	106
21	75	81	102	84	76	115	119	97	73	69	76	98
22	74	81	126	85	76	103	112	94	85	66	72	91
23	73	83	101	83	76	97	110	91	77	65	71	89
24	73	82	95	82	76	95	134	87	77	66	69	89
25	72	81	95	80	76	99	127	83	79	66	69	92
26	73	86	94	79	76	152	118	81	83	64	62	84
27	77	83	90	79	77	170	108	141	120	68	60	84
28	81	78	90	83	77	158	102	344	110	70	64	81
29	80	78	88	87	77	149	98	286	98	66	61	77
30	88	75	84	103	------	131	98	186	97	63	60	75
31	97	------	82	91	------	126	------	145	------	64	60	------
TOTAL	2387	2696	3199	2512	2791	3321	3409	3419	2552	2196	2102	2639
MEAN	77.0	89.9	103	81.0	96.2	107	114	110	85.1	70.8	67.8	88.0
MAX	101	137	218	103	295	170	145	344	122	91	96	182
MIN	65	75	74	72	70	75	97	81	65	63	60	65
CFSM	1.36	1.58	1.81	1.43	1.69	1.88	2.01	1.94	1.50	1.25	1.19	1.55
IN	1.56	1.77	2.09	1.64	1.83	2.17	2.23	2.29	1.67	1.44	1.38	1.73

CAL YR	1967	TOTAL	37,115	MEAN	102	MAX	428	MIN	61	CFSM	1.80	IN	24.30
WTR YR	1968	TOTAL	33,223	MEAN	90.8	MAX	344	MIN	60	CFSM	1.60	IN	21.75

PEAK DISCHARGE (BASE, 270 CFS)

DATE	TIME	G.HT.	DISCHARGE
02-02	1800	8.84	359
05-28	2000	9.05	388

4-1400. Prior Creek near Selkirk, Mich.

Location.--Lat 44°20'10", long 84°04'00", in SE 1/4 sec.33, T.23 N., R.3 E., on right bank a quarter of a mile upstream from mouth, half a mile downstream from Ammond Creek, and 1 1/2 miles north of Selkirk.

Drainage area.--21.4 sq mi.

Records available.--September 1950 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 840 ft (by barometer).

Average discharge.--18 years, 16.3 cfs.

Extremes.--Maximum discharge during year, 162 cfs May 28 (gage height, 4.72 ft); maximum gage height, 4.85 ft Feb. 2 (backwater from ice); minimum discharge, 4.7 cfs Dec. 5.
1950-68: Maximum discharge, 584 cfs May 20, 1959 (gage height, 5.64 ft); minimum, 2.4 cfs Nov. 4, 1966, result of freeze-up.

Remarks.--Records good except those for the winter periods, which are fair. Records of water temperatures for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.0	17	6	10	25	11	36	16	27	15	7.7	8.6
2	7.1	36	5.9	9	85	11	31	14	29	11	6.7	14
3	6.7	25	6.3	9.5	50	11	29	14	24	9.3	6.5	9.3
4	6.3	23	6.1	9.5	35	11	38	15	21	8.8	6.5	8.2
5	5.9	17	5.9	10	25	12	42	14	18	17	6.7	9.7
6	5.7	13	7.3	10	20	12	28	13	15	14	18	8.6
7	5.9	11	21	10	18	12	21	12	22	9.9	11	7.7
8	7.3	9.9	48	10	16	12	21	12	45	8.6	8.4	8.4
9	9.7	10	22	10	15	17	20	13	23	29	7.7	9.5
10	9.0	10	12	10	13	32	19	12	17	26	7.3	46
11	7.3	22	13	10	12	25	20	11	16	15	6.5	67
12	6.7	27	68	10	11	20	19	11	19	12	6.5	22
13	6.5	19	80	11	12	17	18	16	14	10	6.5	14
14	7.7	15	30	11	12	15	20	16	11	9.3	6.3	11
15	7.7	13	16	11	12	15	40	20	9.5	8.6	6.1	10
16	19	11	13	11	12	16	27	23	8.6	8.2	6.7	9.3
17	15	9.5	12	11	11	18	22	26	7.5	8.2	6.9	8.8
18	10	12	14	11	11	20	25	18	8.4	8.2	6.5	8.2
19	8.8	12	19	11	11	21	23	18	18	8.8	13	11
20	7.9	9.3	16	11	11	28	20	22	13	7.7	11	23
21	7.5	8.4	21	11	11	23	32	20	12	7.3	8.2	15
22	7.3	8.8	32	11	11	20	25	23	15	7.3	7.7	13
23	7.1	10	25	11	11	17	24	20	12	7.1	7.1	13
24	6.9	9.0	17	11	11	16	39	16	16	7.1	6.9	14
25	7.3	9.0	15	10	11	22	33	13	21	6.9	6.3	16
26	7.3	13	14	11	11	64	27	12	22	6.5	6.5	12
27	7.7	9.9	13	11	11	83	21	49	34	7.3	6.3	12
28	11	8.5	12	11	11	51	18	144	37	7.7	6.1	12
29	9.7	8	12	12	11	44	17	108	28	6.9	6.1	9.9
30	12	7	11	18	------	36	18	52	20	6.3	6.1	9.3
31	17	------	11	15	------	34	------	35	------	6.5	6.3	------
TOTAL	270.0	413.3	504.5	338.0	516	746	773	808	583.0	321.5	236.1	440.5
MEAN	8.71	13.8	19.5	10.9	17.8	24.1	25.8	26.1	19.4	10.4	7.62	14.7
MAX	19	36	80	18	85	83	42	144	45	29	18	67
MIN	5.7	7	5.9	9	11	11	17	11	7.5	6.3	6.1	7.7
CFSM	.407	.645	.911	.509	.832	1.13	1.21	1.22	.907	.486	.356	.687
IN	.47	.72	1.05	.59	.90	1.30	1.34	1.40	1.01	.56	.41	.77

CAL YR	1967	TOTAL	7,380.5	MEAN	20.2	MAX	224	MIN	5.5	CFSM	.944	IN 12.83
WTR YR	1968	TOTAL	6,049.9	MEAN	16.5	MAX	144	MIN	5.7	CFSM	.771	IN 10.51

PEAK DISCHARGE (BASE, 100 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-13	0130	4.65	120	03-27	0300	4.30	125
02-02	1730	4.85	120	05-28	1900	4.72	162

4-1405. Rifle River at Selkirk, Mich.

Location.--Lat 44°18'50", long 84°04'00", in NE 1/4 sec.9, T.22 N., R.3 E., on left bank at upstream side of highway bridge at Selkirk, 1 1/2 miles downstream from Prior Creek.

Drainage area.--117 sq mi.

Records available.--September 1950 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 828.47 ft above mean sea level, datum of 1929.

Average discharge.--18 years, 140 cfs.

Extremes.--Maximum discharge during year, 630 cfs May 29 (gage height, 3.32 ft); maximum gage height, 3.43 ft Jan. 4 (backwater from ice); minimum discharge, 73 cfs Aug. 30.
1950-68: Maximum discharge, 2,760 cfs May 20, 1959 (gage height, 6.76 ft); minimum, 55 cfs Aug. 19, 1958.

Remarks.--Records good. Some regulation from dams above station. Records of water temperatures for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	100	140	108	90	220	110	205	138	214	149	88	84
2	90	202	108	85	510	110	182	132	208	126	84	124
3	86	177	108	90	350	110	174	129	182	115	79	100
4	84	168	108	90	220	110	208	129	160	110	79	92
5	79	146	108	95	190	115	242	126	140	132	84	100
6	77	129	110	95	171	110	196	121	126	124	140	95
7	77	121	149	95	166	110	182	115	166	105	115	88
8	86	115	223	95	149	110	177	115	217	102	108	88
9	105	115	171	95	146	182	166	121	166	154	100	102
10	108	115	146	95	130	208	163	115	152	146	95	230
11	100	152	146	100	110	177	163	110	143	115	88	318
12	97	174	308	100	100	152	157	110	143	105	86	194
13	90	154	404	100	115	140	152	115	129	100	84	149
14	95	140	245	100	115	130	157	118	118	92	82	132
15	92	129	188	105	115	115	223	135	113	92	79	118
16	140	120	163	105	110	146	194	146	110	88	84	110
17	140	115	146	105	105	166	174	168	102	86	88	110
18	115	124	143	105	105	171	177	138	105	86	84	97
19	105	129	154	105	105	182	180	135	143	95	115	105
20	100	121	140	105	105	211	166	152	118	84	143	163
21	97	115	146	105	110	182	191	140	115	88	105	152
22	95	118	191	105	110	157	182	140	135	86	97	135
23	92	124	160	105	110	138	174	135	126	82	92	129
24	95	121	140	100	110	140	223	124	132	84	88	135
25	95	121	126	100	110	143	217	110	157	82	88	143
26	97	129	120	100	110	242	194	105	160	82	82	124
27	100	124	115	102	110	311	171	232	248	84	79	124
28	110	120	110	102	110	271	152	539	226	95	82	121
29	110	110	110	113	110	254	149	562	185	82	82	115
30	115	110	105	163	------	220	146	359	160	79	75	110
31	140	------	100	138	------	202	------	258	------	79	75	------
TOTAL	3,112	3,978	4,799	3,188	4,327	5,125	5,437	5,272	4,599	3,129	2,850	3,887
MEAN	100	133	155	103	149	165	181	170	153	101	91.9	130
MAX	140	202	404	163	510	311	242	562	248	154	143	318
MIN	77	110	100	85	100	110	146	105	102	79	75	84
CFSM	.855	1.14	1.32	.880	1.27	1.41	1.55	1.45	1.31	.863	.785	1.11
IN	.99	1.26	1.53	1.01	1.38	1.63	1.73	1.68	1.46	.995	.906	1.24

CAL YR	1967	TOTAL	58,666	MEAN	161	MAX	830	MIN	73	CFSM	1.38	IN	18.65
WTR YR	1968	TOTAL	49,703	MEAN	136	MAX	562	MIN	75	CFSM	1.16	IN	15.80

PEAK DISCHARGE (BASE, 500 CFS)

DATE	TIME	G.HT.	DISCHARGE
02-02	1100	3.17	562
05-29	0700	3.32	630

4-1410. South Branch Shepards Creek near Selkirk, Mich.

Location.--Lat 44°18'25", long 84°05'10", in SE 1/4 sec.8, T.22 N., R.3 E., on right bank 200 ft upstream from mouth and 1 mile southwest of Selkirk.

Drainage area.--1.15 sq mi.

Records available.--October 1951 to September 1968.

Gage.--Water-stage recorder and V-notch sharp-crested weir. Altitude of gage is 845 ft (by barometer).

Average discharge.--17 years, 0.517 cfs.

Extremes.--Maximum discharge during year, 38 cfs Feb. 2 (gage height, 3.27 ft); minimum, 0.01 cfs Aug. 14, 15. 1951-68: Maximum discharge, 181 cfs Apr. 3, 1956 (gage height, 4.42 ft), from rating curve extended above 40 cfs by logarithmic plotting; no flow at times each year, except in 1956, 1967 and 1968.

Remarks.--Records fair.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.08	0.33	0.09	0.06	14	0.06	0.58	0.14	0.35	0.14	0.04	0.11
2	.06	.50	.09	.06	16	.06	.38	.12	.37	.09	.02	.16
3	.04	.33	.11	.08	1.41	.06	.38	.12	.22	.08	.02	.10
4	.04	.31	.11	.09	.58	.62	1.4	.13	.14	.06	.02	.07
5	.04	.24	.10	.07	.42	1.4	.83	.12	.10	.06	.06	.14
6	.04	.20	.14	.07	.45	.33	.38	.11	.09	.05	.18	.08
7	.04	.16	.78	.07	.83	.50	.33	.11	.43	.04	.08	.06
8	.10	.15	.64	.07	.35	3.6	.29	.11	.37	.04	.06	.07
9	.15	.14	.28	.07	.20	3.4	.26	.10	.23	.49	.04	.17
10	.13	.14	.22	.08	.13	2.2	.26	.09	.28	.22	.04	1.9
11	.09	.38	.28	.09	.09	.87	.26	.09	.26	.12	.03	.58
12	.09	.33	9.7	.09	.08	.38	.24	.09	.22	.09	.02	.28
13	.09	.23	1.4	.09	.07	.22	.26	.11	.15	.06	.02	.20
14	.09	.20	.42	.09	.06	.19	.35	.11	.10	.05	.02	.14
15	.08	.14	.26	.09	.06	.28	.50	.14	.09	.04	.02	.11
16	.38	.13	.22	.09	.06	.56	.29	.20	.08	.04	.04	.09
17	.16	.14	.19	.09	.06	.50	.26	.20	.06	.04	.09	.08
18	.12	.18	.19	.09	.05	.45	.29	.14	.09	.04	.05	.06
19	.10	.16	.23	.11	.04	.50	.26	.15	.12	.04	.10	.13
20	.09	.14	.19	.11	.04	1.0	.24	.18	.08	.04	.08	.58
21	.09	.13	.42	.12	.04	.40	.56	.16	.09	.04	.05	.28
22	.09	.13	.64	.13	.04	.26	.33	.14	.10	.03	.04	.22
23	.08	.14	.22	.13	.03	.20	.33	.14	.09	.03	.04	.20
24	.08	.13	.16	.11	.03	.20	.66	.10	.14	.04	.03	.35
25	.09	.13	.16	.09	.03	.64	.45	.09	.57	.03	.02	.31
26	.08	.16	.13	.09	.02	4.9	.33	.08	.56	.02	.02	.23
27	.10	.13	.10	.09	.03	1.5	.20	1.7	2.0	.06	.02	.23
28	.14	.11	.09	.13	.06	1.1	.18	4.1	.83	.05	.02	.18
29	.13	.09	.08	2.4	.06	.87	.16	1.5	.40	.04	.02	.16
30	.19	.09	.08	2.2	------	.58	.15	.91	.24	.03	.02	.13
31	.22	------	.08	.76	------	.58	------	.47	------	.03	.02	------
TOTAL	3.30	5.77	17.80	7.91	35.32	28.41	11.39	11.95	8.85	2.23	1.33	7.40
MEAN	.106	.192	.574	.255	1.22	.916	.380	.385	.295	.072	.043	.247
MAX	.38	.50	9.7	2.4	16	4.9	1.4	4.1	2.0	.49	.18	1.9
MIN	.04	.09	.08	.06	.02	.06	.15	.08	.06	.02	.02	.06
CFSM	.092	.167	.499	.222	1.06	.797	.330	.335	.257	.063	.037	.215
IN	.11	.19	.58	.26	1.14	.92	.37	.39	.29	.07	.04	.24

CAL YR	1967	TOTAL	212.43	MEAN	.582	MAX	20	MIN	.01	CFSM	.506	IN 6.87
WTR YR	1968	TOTAL	141.66	MEAN	.387	MAX	16	MIN	.02	CFSM	.337	IN 4.58

PEAK DISCHARGE (BASE, 20 CFS)

DATE	TIME	G.HT.	DISCHARGE
02-02	0400	3.27	38

4-1420. Rifle River near Sterling, Mich.

Location.--Lat 44°04', long 84°02', in SW 1/4 sec.5, T.19 N., R.4 E., on left bank 30 ft downstream from bridge on county highway, 3 miles north of Sterling, and 18 miles upstream from mouth.

Drainage area.--320 sq mi, approximately.

Records available.--November 1905 to December 1908 (gage heights and discharge measurements only), October 1936 to September 1968. Published as "Rifle River at Michigan Highway 70 near Sterling" 1936-61. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Digital water-stage recorder. Datum of gage is 649.48 ft above mean sea level, datum of 1929. November 1905 to December 1908, staff gage at site 400 ft downstream at different datum. Jan. 13, 1937, to June 7, 1938, chain gage, June 8, 1938, to Jan. 10, 1939, wire-weight gage, and Jan. 11, 1939, to June 16, 1965, graphic water-stage recorder at same site and datum.

Average discharge.--32 years, 302 cfs.

Extremes.--Maximum discharge during year, 1,890 cfs May 28 (gage height, 7.27 ft); maximum gage height, 8.62 ft Feb. 3 (backwater from ice); minimum discharge, 115 cfs Aug. 28.

1936-68: Maximum discharge, 5,340 cfs Mar. 28, 1950 (gage height, 13.74 ft), from rating curve extended above 3,800 cfs; minimum, 75 cfs Nov. 22, 1964, result of freeze-up.

Remarks.--Records good except those for the winter periods, which are fair. Occasional regulation from dams above station. Records of suspended sediment loads for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	190	266	210	180	400	230	502	291	568	331	165	138
2	170	396	210	210	1,400	230	439	279	535	280	156	223
3	170	372	210	240	1,600	230	409	279	482	240	151	231
4	160	331	210	230	700	230	539	278	409	230	146	175
5	150	300	210	230	450	240	709	275	358	290	152	170
6	150	250	210	230	380	230	546	258	321	260	189	173
7	150	240	300	220	350	230	465	244	295	220	260	161
8	170	220	450	210	320	240	425	244	404	210	199	157
9	200	220	350	210	300	400	390	247	339	350	191	177
10	210	230	300	210	280	540	377	239	319	310	179	425
11	193	290	280	220	220	460	369	229	313	260	169	608
12	180	360	700	220	230	390	349	227	323	230	165	408
13	175	300	950	220	230	350	332	275	293	210	182	281
14	179	270	600	220	230	310	346	283	263	200	145	234
15	181	250	441	230	240	270	467	313	249	190	140	210
16	264	230	268	230	230	330	441	327	235	180	142	194
17	284	210	340	230	220	360	369	374	221	175	160	185
18	230	230	302	230	220	380	357	320	219	175	152	177
19	203	250	317	230	220	410	358	293	263	188	150	185
20	193	230	305	240	230	430	335	315	249	173	214	284
21	184	220	321	240	230	438	410	304	225	165	174	280
22	180	230	422	230	230	355	413	301	247	168	142	252
23	177	230	344	230	230	307	382	304	241	158	134	237
24	176	230	302	230	230	290	523	278	249	158	128	244
25	175	230	250	220	230	300	522	240	414	156	124	268
26	174	240	221	220	230	616	452	233	455	151	123	232
27	188	240	220	220	230	871	388	541	640	157	118	218
28	210	230	220	220	230	740	341	1,720	625	180	116	219
29	209	220	210	230	230	633	314	1,610	475	165	120	197
30	212	210	200	320	------	564	300	1,100	384	153	130	187
31	248	------	190	280	------	509	------	774	------	151	132	------
TOTAL	5,935	7,725	10,163	7,080	10,520	12,113	12,569	13,004	10,613	6,464	4,848	7,130
MEAN	191	258	328	228	363	391	419	419	354	209	156	238
MAX	284	396	950	320	1,600	871	709	1,720	640	350	260	608
MIN	150	210	190	180	220	230	300	227	219	151	116	138
CFSM	.60	.80	1.02	.71	1.13	1.22	1.31	1.31	1.11	.65	.49	.74
IN.	.69	.90	1.18	.82	1.22	1.41	1.46	1.51	1.23	.75	.56	.83

CAL YR 1967 TOTAL 123,505 MEAN 338 MAX 1,990 MIN 129 CFSM 1.06 IN 14.35
WTR YR 1968 TOTAL 108,164 MEAN 296 MAX 1,720 MIN 116 CFSM .92 IN 12.57

PEAK DISCHARGE (BASE, 1,600 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
02-03	0500	8.62	1,700	05-28	1400	7.27	1,890

Note.--No gage-height Nov. 5 to Dec. 14.

4-1435. North Branch Kawkawlin River near Kawkawlin, Mich.

Location.--Lat 43°40'05", long 83°58'15", in SE 1/4 sec.27, T.15 N., R.4 E., on left bank 50 ft upstream from bridge on Beaver Road, 1 3/4 miles northwest of Kawkawlin, and 2 1/2 miles upstream from mouth.

Drainage area.--101 sq mi.

Records available.--March 1951 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 584.00 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Mar. 13, 1951, to Sept. 26, 1951, staff gage at site 70 ft downstream, and Sept. 27, 1951, to Sept. 30, 1960, water-stage recorder at present site, at datum 2.00 ft higher.

Average discharge.--17 years, 54.3 cfs.

Extremes.--Maximum discharge during year, 906 cfs May 30 (gage height, 9.38 ft); no flow at times. 1951-68: Maximum discharge, 1,540 cfs Apr. 1, 1960, Apr. 13, 1965; maximum gage height, 10.33 ft Apr. 13, 1965; no flow at times in each year.

Remarks.--Records fair. Some diversion above station for irrigation.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.4	4.5	23	25	55	12	224	79	500	154	0.2	
2	.1	19	21	21	200	11	186	68	374	179	.2	
3	.1	16	19	18	400	11	160	59	300	169	.1	
4	0	21	18	16	560	11	149	52	229	145	0	
5	0	17	18	16	500	11	138	46	181	118	0	
6	0	30	19	15	400	11	126	40	145	92	0	
7	0	42	21	15	340	12	134	34	117	69	.3	
8	0	44	27	14	280	14	145	31	91	51	.3	
9	.1	44	35	14	160	18	138	29	67	39	0	
10	.2	43	50	14	130	25	120	27	49	32	0	
11	.1	45	134	14	100	37	102	24	36	26	0	
12	.1	61	307	14	85	70	88	20	30	22	0	
13	.1	57	325	14	75	80	77	16	24	18	0	
14	.1	61	349	14	65	110	69	15	20	16	0	
15	.1	77	343	14	55	130	65	15	18	16	0	
16	1.4	84	362	15	50	120	62	15	16	17	0	
17	1.7	82	294	15	45	110	58	14	14	18	0	
18	1.1	76	229	16	40	106	59	14	12	18	0	
19	1.0	66	186	16	34	104	61	20	12	17	0	
20	.9	53	153	17	31	121	61	30	10	14	0	
21	.8	45	145	18	28	130	57	37	8.8	11	0	
22	.8	42	145	18	24	130	53	40	7.9	9.1	0	
23	.7	41	135	18	22	130	51	43	6.6	6.8	0	
24	.6	40	120	18	19	120	50	54	6.2	6.4	0	
25	.6	37	110	13	17	110	56	66	6.6	5.0	0	
26	.6	34	100	18	15	222	65	70	9.1	4.2	0	
27	1.2	32	90	18	14	229	73	85	30	3.6	0	
28	4.8	32	80	19	13	284	91	158	42	2.9	0	
29	4.2	29	62	22	12	343	95	296	62	1.8	0	
30	4.2	27	45	25	------	320	90	842	103	1.2	0	------
31	3.8	------	32	28	------	272	------	707	------	.7		
TOTAL	29.8	1,301.5	3,997	537	3,769	3,414	2,903	3,046	2,527.2	1,282.7	1.1	0
MEAN	.96	43.4	129	17.3	130	110	96.8	98.3	84.2	41.4	.04	0
MAX	4.8	84	362	28	560	343	224	842	500	179	.3	0
MIN	0	4.5	18	14	12	11	50	14	6.2	.7	0	0
CFSM	.010	.43	1.28	.171	1.29	1.09	.958	.973	.834	.410	.00040	0
IN	.001	.48	1.47	.20	1.39	1.26	1.07	1.12	.93	.47	.0004	0

CAL YR 1967	TOTAL	27,633.5	MEAN	75.7	MAX	924	MIN	0	CFSM	.750	IN	10.18
WTR YR 1968	TOTAL	22,808.3	MEAN	62.3	MAX	842	MIN	0	CFSM	.617	IN	8.40

4-1439. Shiawassee River at Linden, Mich.

Location.--Lat 42°48'56", long 83°48'08", in SW¼ sec.19, T.5 N., R.6 E., on right bank at upstream side of bridge on Hogan Road, 1.0 mile west of Linden.

Drainage area.--81.2 sq mi.

Records available.--October 1967 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 850 ft (from topographic map).

Extremes.--Maximum discharge during year, 262 cfs Feb. 7 (gage height, 6.16 ft); maximum gage height, 6.31 ft Feb. 10 (backwater from ice); minimum discharge, 11 cfs July 23 (gage height 3.28 ft).

Remarks.--Records good except those for the winter period and those for period of no gage-height record, which are fair. Low flow regulated at times by lakes above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	18	45	46	64	118	27	116	62	59	169	20	41
2	17	56	42	59	165	27	116	59	64	173	19	41
3	16	66	43	54	204	27	114	54	66	180	19	41
4	14	70	39	50	208	28	114	52	65	159	20	40
5	13	70	31	46	213	28	110	48	62	159	21	41
6	13	70	54	42	257	29	112	44	56	147	21	39
7	13	70	42	38	260	30	107	42	50	135	25	33
8	15	70	33	36	244	32	101	41	40	117	29	28
9	17	64	32	34	226	35	96	41	27	92	29	28
10	17	60	50	32	180	37	89	37	25	84	29	29
11	18	60	62	31	140	39	84	33	21	74	29	34
12	19	60	49	30	120	42	80	32	24	60	29	31
13	18	64	48	29	100	45	76	32	27	50	28	27
14	16	69	57	28	86	47	71	33	24	43	27	25
15	16	69	58	28	76	50	69	33	23	39	27	25
16	20	66	57	28	70	52	63	33	23	36	29	25
17	23	65	59	28	62	60	60	33	21	32	71	23
18	28	65	63	30	57	63	59	33	17	29	89	23
19	33	63	79	32	52	66	47	35	16	27	76	22
20	30	62	104	32	46	70	44	38	19	22	78	26
21	28	60	107	35	42	73	43	38	20	18	74	29
22	25	60	107	35	38	74	47	38	25	16	77	27
23	23	60	107	36	36	76	52	41	26	13	83	32
24	23	58	104	36	34	81	57	42	23	17	95	37
25	23	57	100	36	32	90	59	44	31	19	101	45
26	25	56	97	36	30	103	60	52	66	18	96	44
27	27	55	92	37	29	112	60	60	76	17	82	44
28	35	52	90	38	28	111	59	68	79	20	65	41
29	40	50	84	40	27	111	59	63	95	22	59	33
30	45	50	76	47	------	113	62	59	132	22	48	35
31	45	------	70	56	------	115	------	59	------	21	43	------
TOTAL	713	1,842	2,082	1,183	3,180	1,893	2,286	1,379	1,302	2,030	1,538	989
MEAN	23.0	61.4	67.2	38.2	110	61.1	76.2	44.5	43.4	65.5	49.6	33.0
MAX	45	70	107	64	260	115	116	68	132	180	101	45
MIN	13	45	31	28	27	27	43	32	16	13	19	22
CFSM	.28	.76	.83	.47	1.35	.75	.94	.55	.53	.81	.61	.41
IN.	.33	.84	.95	.54	1.46	.87	1.05	.63	.60	.93	.70	.45

CAL YR 1967: TOTAL — MEAN — MAX — MIN — CFSM — IN —
WAT YR 1968: TOTAL 20,417 MEAN 55.8 MAX 260 MIN 13 CFSM .69 IN 9.35

Note.--No gage height record Oct. 1 to Nov. 13

4-1440. Shiawassee River at Byron, Mich.

Location.--Lat 42°49'25", long 83°56'45", on line between secs. 14 and 23, T.5 N., R.4 E., on upstream side of highway bridge at Byron, a quarter of a mile downstream from milldam which is just upstream from South Branch Shiawassee River.

Drainage area.--368 sq mi.

Records available.--October 1947 to September 1968. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Digital water-stage recorder. Datum of gage is 811.54 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Oct. 17, 1960, wire-weight gage and crest-stage gage, and Oct. 17, 1960 to May 16, 1968, graphic water-stage recorder at same site and datum.

Average discharge.--21 years, 240 cfs.

Extremes.--Maximum discharge during year, 2,150 cfs Feb.5 (gage height, 11.34 ft); minimum, 45 cfs Oct. 4 (gage height, 4.16 ft). 1947-68: Maximum discharge, 2,900 cfs Apr. 1, 1960; maximum gage height, 12.58 ft May 15, 1956, Apr. 1, 1960; minimum discharge, 19 cfs Aug. 16, 1965; minimum gage height, 3.55 ft Sept. 16, 1960.

Remarks.--Records good except those for the winter period, which are fair. Low flow slightly regulated at times by mills above station. Records of water temperature for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	68	176	146	270	900	120	530	161	598	1,670	107	112
2	63	226	143	230	1,270	120	490	161	514	1,580	111	101
3	60	262	144	210	1,600	120	456	156	431	1,430	103	98
4	52	286	136	200	1,850	120	464	149	342	1,230	94	102
5	49	300	144	190	2,090	120	486	143	240	1,030	87	99
6	51	298	144	180	2,020	120	512	133	202	704	97	95
7	54	286	158	170	1,580	120	490	132	182	436	111	94
8	61	272	204	170	1,100	130	430	127	173	327	113	84
9	65	256	248	160	900	130	400	122	159	286	115	71
10	65	214	262	150	600	140	372	121	146	253	202	89
11	69	179	296	150	500	150	322	114	131	202	325	95
12	72	177	382	150	450	150	284	111	118	164	403	90
13	72	181	438	150	425	150	266	107	127	143	439	83
14	73	190	460	150	410	161	256	108	123	126	390	80
15	74	181	430	150	400	172	266	112	119	114	301	78
16	77	172	380	190	350	190	306	112	113	111	212	69
17	93	161	338	180	300	272	312	116	109	111	232	71
18	112	161	314	170	250	312	284	127	114	110	273	72
19	130	185	264	160	220	314	266	127	111	115	349	75
20	133	194	214	150	200	320	270	128	105	113	393	93
21	128	189	280	150	190	326	264	139	102	103	400	101
22	127	183	394	150	170	334	244	197	107	92	345	104
23	118	185	482	150	160	330	234	218	128	94	304	96
24	121	176	555	150	150	334	220	217	136	99	248	147
25	121	172	630	150	150	366	216	212	189	106	174	198
26	121	168	580	150	140	516	212	147	408	104	152	220
27	132	158	500	150	130	665	214	188	756	108	150	224
28	146	154	400	180	130	775	179	321	1,160	113	145	183
29	174	141	360	340	130	772	156	478	1,540	108	137	151
30	161	160	350	524	------	678	163	585	1,690	114	124	131
31	154	------	300	602	------	600	------	617	------	106	115	------
TOTAL	2,996	6,043	10,076	6,226	18,765	9,127	9,564	5,886	10,373	11,402	6,751	3,306
MEAN	96.6	201	325	201	647	294	319	190	346	368	218	110
MAX	174	300	630	602	2,090	775	530	617	1,690	1,670	439	224
MIN	49	141	136	150	130	120	156	107	102	92	87	69
CFSM	.26	.55	.88	.55	1.76	.80	.87	.52	.94	1.00	.59	.30
IN.	.30	.61	1.02	.63	1.90	.92	.97	.59	1.05	1.15	.68	.33

CAL YR 1967: TOTAL 86,730 MEAN 238 MAX 940 MIN 36 CFSM .65 IN 8.76
WAT YR 1968: TOTAL 100,515 MEAN 275 MAX 2,090 MIN 49 CFSM .75 IN 10.16

4-1445. Shiawassee River at Owosso, Mich.

Location.--Lat 43°00'54", long 84°10'52", in SW1/4 sec.12, T.7 N., R.2 E., on right bank on grounds of sewage-treatment plant, 1 1/2 miles north of Owosso.

Drainage area.--538 sq mi.

Records available.--March 1931 to September 1968. Monthly discharge only for some periods, published in WSP 1307. Gage-height records for flood seasons collected in this vicinity 1904, 1910-30 are contained in reports of U. S. Weather Bureau.

Gage.--Water-stage recorder. Datum of gage is 707.25 ft above mean sea level, datum of 1929. Prior to Oct. 15, 1933, at site 1 1/2 miles upstream at datum 5.46 ft higher.

Average discharge.--37 years, 310 cfs.

Extremes.--Maximum discharge during year, 2,990 cfs Feb. 2 (gage height, 7.29 ft); minimum, 29 cfs Sept. 16; minimum gage height, 1.84 ft Oct. 3.
1931-68: Maximum discharge, 6,240 cfs Apr. 6, 1947 (gage height, 10.35 ft); minimum, 0.2 cfs July 27, 1934 (gage height, 1.12 ft); minimum daily, 2.0 cfs July 28, 1934.

Remarks.--Records good except those for the winter periods, which are fair. Flow regulated below about 800 cfs by powerplant at Shiawasseetown prior to February 1953. Records of suspended sediment loads for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	74	239	195	350	1,200	170	829	222	706	2,010	141	157
2	78	248	189	300	2,680	170	726	219	690	1,910	136	157
3	78	314	187	300	2,460	170	666	152	552	1,770	136	147
4	80	369	179	280	2,170	160	690	214	507	1,580	128	136
5	74	375	170	280	2,090	160	714	211	409	1,360	126	136
6	64	365	176	260	2,120	160	690	203	289	1,140	111	134
7	59	352	189	250	2,130	170	678	192	268	811	121	131
8	62	333	208	240	1,730	180	618	189	256	574	126	126
9	68	320	254	230	1,100	190	546	184	256	479	134	121
10	72	308	330	220	800	200	504	170	231	437	134	128
11	74	280	504	210	660	220	465	162	217	388	219	147
12	76	254	811	210	640	210	409	152	206	333	356	149
13	80	242	726	200	620	200	369	144	179	283	423	139
14	82	254	642	198	600	220	382	160	181	248	451	124
15	86	256	586	217	550	250	423	157	195	219	406	114
16	102	233	514	220	476	292	420	147	179	200	428	106
17	106	231	476	220	352	340	426	154	173	176	1,020	99
18	114	225	430	220	330	416	420	152	165	162	570	93
19	131	231	395	220	310	448	388	168	173	99	490	95
20	154	251	343	220	290	468	369	170	170	134	556	317
21	162	259	626	222	270	482	365	168	165	128	510	317
22	162	248	1,060	217	250	486	359	173	165	124	468	228
23	160	242	842	220	230	490	346	225	170	118	406	211
24	173	242	730	230	220	454	320	251	192	118	362	187
25	144	228	730	220	210	521	308	251	322	118	301	248
26	144	222	600	210	200	1,060	295	292	780	124	233	298
27	162	217	520	208	190	1,430	286	468	1,300	221	206	314
28	181	195	520	250	180	1,260	274	770	1,360	200	198	304
29	195	184	500	600	180	1,200	239	710	1,680	162	192	262
30	222	208	500	1,100	------	1,060	222	730	2,000	128	184	225
31	251	------	450	1,000	------	925	------	762	------	126	168	------
TOTAL	3,670	7,925	14,582	9,322	25,238	14,162	13,746	8,322	14,136	15,880	9,440	5,350
MEAN	118	264	470	301	870	457	458	268	471	512	305	178
MAX	251	375	1,060	1,100	2,680	1,430	829	770	2,000	2,010	1,020	317
MIN	59	184	170	198	180	160	222	144	165	99	111	93
CFSM	.22	.49	.87	.56	1.62	.85	.85	.50	.88	.95	.57	.33
IN.	.25	.55	1.01	.64	1.74	.98	.95	.58	.98	1.10	.65	.37

CAL YR 1967: TOTAL 126,564 MEAN 347 MAX 2,170 MIN 20 CFSM .64 IN. 8.75
WTR YR 1968: TOTAL 141,773 MEAN 387 MAX 2,680 MIN 59 CFSM .72 IN. 9.80

PEAK DISCHARGE (BASE, 1,500 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
02-02	1500	7.29	2,990	07-01	1300	6.29	2,040

4-1450. Shiawassee River near Fergus, Mich.

Location.--Lat 43°15'17", long 84°06'20", in sec.22, T.10 N., R.3 E., on downstream handrail of highway bridge, 1.2 miles east of Fergus and 1 3/4 miles upstream from Bear Creek.

Drainage area.--637 sq mi.

Records available.--October 1939 to September 1968. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Wire-weight gage read twice daily. Datum of gage is 587.80 ft above mean sea level, datum of 1929.

Average discharge.--29 years, 396 cfs.

Extremes.--Maximum discharge during year, 3,500 cfs Feb. 2; maximum gage height, 11.90 ft Feb. 3 (backwater from ice); minimum daily discharge, 78 cfs Oct. 7-9.
1939-68: Maximum discharge, 7,500 cfs Apr. 6, 1947 (includes overflow bypassing gage); maximum gage height, 13.44 ft Mar. 29, 1960; minimum discharge, 27 cfs Aug. 8, 1966; minimum gage-height observed, 0.49 ft Sept. 20, 1967.

Remarks.--Records good except those for the winter period, which are fair. Some regulation at low stages by powerplant above Owosso prior to February 1953; occasional regulation at low stages since.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	92	227	252	400	1.800	200	900	270	799	2.220	135	179
2	83	308	241	350	3.100	200	792	255	684	2.100	138	174
3	80	350	216	350	2.800	200	726	240	610	1.930	127	170
4	82	380	193	350	2.500	200	744	240	588	1.750	127	160
5	86	400	201	320	2.500	200	764	240	540	1.580	122	160
6	80	374	183	300	2.500	200	754	233	344	1.370	120	160
7	78	359	200	250	2.500	200	747	207	320	1.000	110	150
8	78	350	232	240	2.000	220	610	202	310	700	116	150
9	78	345	246	240	1.500	230	595	202	300	548	117	150
10	84	326	282	240	1.000	250	565	192	280	498	122	160
11	79	326	508	240	850	250	540	174	260	448	117	160
12	80	310	1.470	240	800	250	488	170	230	400	187	157
13	84	298	1.180	240	750	250	450	166	209	317	325	151
14	95	276	820	250	700	274	500	177	183	270	395	150
15	110	286	670	250	650	300	550	182	185	248	412	140
16	128	278	628	250	550	350	575	177	197	222	370	122
17	124	262	518	250	450	400	508	180	175	209	2.000	115
18	108	278	480	250	400	450	510	183	172	200	1.340	105
19	110	260	433	250	370	490	480	185	160	150	602	105
20	123	256	409	250	350	495	465	190	157	110	585	122
21	120	272	438	250	320	510	440	188	156	140	560	495
22	120	270	673	250	300	520	410	188	154	129	530	309
23	120	268	742	250	270	535	390	210	153	129	460	250
24	128	254	778	270	260	540	418	236	147	127	405	224
25	130	245	727	260	250	568	380	253	163	128	350	202
26	149	234	700	250	240	1.540	353	400	628	117	289	269
27	160	223	650	250	220	1.720	335	568	1.920	129	234	320
28	170	219	600	350	210	1.530	319	1.020	1.620	253	209	301
29	190	172	600	700	210	1.340	305	992	1.650	233	202	270
30	205	243	600	1.500	------	1.160	283	904	1.820	163	204	233
31	241	------	550	1.200	------	1.030	------	866	------	133	195	------
TOTAL	3.595	8.649	16.420	11.040	30.350	16.602	15.896	9.890	15.114	17.951	11.205	5.813
MEAN	116	288	530	356	1,047	536	530	319	504	579	361	194
MAX	241	400	1,470	1,500	3,100	1,720	900	1,020	1,920	2,220	2,000	495
MIN	78	172	183	240	210	200	283	166	147	110	110	105
CFSM	.18	.45	.83	.56	1.64	.84	.83	.50	.79	.91	.57	.30
IN.	.21	.50	.96	.64	1.77	.97	.93	.58	.88	1.05	.65	.34

CAL YR 1967:	TOTAL	146,451	MEAN	401	MAX	3,650	MIN	30	CFSM	.63	IN.	8.55
WTR YR 1968:	TOTAL	162,525	MEAN	444	MAX	3,100	MIN	78	CFSM	.70	IN.	9.49

4-1460. Farmers Creek near Lapeer, Mich.

Location.--Lat 43°02', long 83°20', in sec.6, T.7 N., R.10 E., on left bank at sewage-treatment plant at Michigan Home and Training School, 2 miles west of Lapeer.

Drainage area.--57 sq mi, approximately.

Records available.--October 1932 to September 1968. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Water-stage recorder and concrete control. Datum of gage is 805.79 ft above mean sea level, datum of 1929. Prior to May 25, 1954, staff gage at same site and datum.

Average discharge.--36 years, 28.4 cfs.

Extremes.--Maximum discharge during year, 497 cfs Feb. 4 (gage height, 18.06 ft); minimum, 3.4 cfs Sept. 7, 8 (gage height, 15.08 ft).

1932-68: Maximum discharge, 1,280 cfs Apr. 6, 1947 (gage height, 19.87 ft, from floodmark), from rating curve extended above 660 cfs on basis of contracted-opening measurement of peak flow; minimum not determined.

Remarks.--Records good except those for the winter period, which are fair. Prior to 1941, occasional regulation by dam above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	12	29	15	28	250	16	104	28	62	157	9.8	4.3
2	12	29	15	27	386	16	91	27	49	153	9.0	5.2
3	11	30	15	25	450	17	78	26	40	144	8.6	4.3
4	10	36	16	23	435	18	74	25	33	110	7.4	4.0
5	8.6	40	17	21	314	19	70	24	25	72	6.6	4.0
6	7.8	42	18	20	209	21	77	22	22	51	7.0	3.8
7	7.4	40	22	19	150	24	76	21	21	37	11	3.6
8	7.8	36	25	18	128	27	66	20	18	33	12	3.6
9	9.4	33	29	17	100	32	54	19	16	29	12	3.8
10	11	29	32	16	80	47	48	18	14	27	9.8	6.6
11	12	28	40	16	60	55	42	17	14	25	7.0	7.0
12	13	27	51	16	50	57	37	16	14	22	5.8	5.5
13	12	27	68	17	45	50	32	17	13	20	5.2	5.2
14	11	29	83	16	40	47	30	17	14	16	4.9	4.9
15	11	28	72	16	38	51	32	18	14	14	4.6	4.6
16	12	26	60	16	35	57	33	20	12	12	4.6	4.3
17	16	25	47	16	32	78	36	21	12	11	5.2	4.3
18	20	27	41	16	30	101	37	22	11	11	4.9	4.6
19	25	27	37	16	27	101	36	23	9.8	10	5.2	4.9
20	29	28	35	17	25	90	34	25	9.8	9.4	4.9	5.2
21	29	28	47	17	23	82	32	30	11	8.6	4.6	4.9
22	27	28	62	17	21	77	30	32	11	7.8	4.6	4.6
23	24	27	150	18	20	61	30	33	11	7.0	4.6	5.2
24	20	26	185	18	19	58	32	33	11	8.2	4.6	5.2
25	17	26	139	19	17	68	32	28	16	9.0	4.3	5.5
26	15	24	108	20	16	86	34	25	31	7.8	3.8	5.2
27	16	21	80	21	16	122	35	31	40	7.0	3.8	4.6
28	18	19	60	23	16	201	33	40	39	8.6	3.8	4.3
29	21	18	45	30	16	187	30	59	71	10	3.8	4.3
30	25	17	35	50	------	152	29	78	144	11	3.8	4.3
31	27	------	30	150	------	125	------	74	------	10	3.8	------
TOTAL	497.0	850	1,679	759	3,048	2,143	1,404	889	808.6	1,058.4	191.0	141.8
MEAN	16.0	28.3	54.2	24.5	105	69.1	46.8	28.7	27.0	34.1	6.16	4.73
MAX	29	42	185	150	450	201	104	78	144	157	12	7.0
MIN	7.4	17	15	16	16	16	29	16	9.8	7.0	3.8	3.6
CFSM	.28	.50	.95	.43	1.84	1.21	.82	.50	.47	.60	.11	.08
IN.	.32	.55	1.10	.50	1.99	1.40	.92	.58	.53	.69	.12	.09

CAL YR 1967: TOTAL 14,098.1 MEAN 38.6 MAX 352 MIN 3.8 CFSM .68 IN 9.20
WAT YR 1968: TOTAL 13,468.8 MEAN 36.8 MAX 450 MIN 3.6 CFSM .65 IN 8.79

PEAK DISCHARGE (BASE, 160 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-24	0800	16.70	205	03-28	1400	16.72	209
02-04	0500	18.06	497	07-01	0800	16.47	160

4-1470. Holloway Reservoir near Otisville, Mich.

Location.--Lat 43°07'15", long 83°29'45", in NW1/4 sec.11, T.8 N., R.8 E., in gatehouse on right side of Holloway Dam on Flint River, 3 1/2 miles southeast of Otisville.

Drainage area.--543 sq mi.

Records available.--March 1954 to September 1968.

Gage.--Water-stage recorder. Datum of gage is at mean sea level, datum of 1929 (levels by city of Flint).

Extremes.--Maximum contents during year, 828,000,000 cu ft May 31 (elevation, 755.65 ft); minimum, 371,000,000 cu ft Oct. 5 (elevation, 749.30 ft).
1954-68: Maximum contents, 996,000,000 cu ft Mar. 8, 1956 (elevation, 757.4 ft); minimum, reservoir empty at times during October, November, 1954, January, February, 1955.

Remarks.--Records good. Reservoir is formed by an earth-fill dam with concrete spillway completed in 1953. Capacity of reservoir, 1,256,000,000 cu ft at elevation 760.00 ft. The spillway section includes two 90-foot drum gates with minimum crest elevation of 751 ft, maximum of 755 ft, three 20-foot radial gates with sill elevation of 745 ft, and 2 sluices (each 4 by 6 ft), one on each side with valve controls. Entrance elevation of sluiceways is 724 ft. Reservoir is used to regulate flow for water supply and sewage dilution for city of Flint.

Cooperation.--Reservoir elevation furnished by city of Flint.

Month-end elevation and contents, water year October 1967 to September 1968

Date	Elevation (feet)‡	Contents (millions of cubic feet)	Change in contents during month	
			Millions of cubic feet	Equivalent in cfs
Sept. 30	749.6	389	-	-
Oct. 31	751.3	491	+102	+38.1
Nov. 30	751.3	491	0	0
Dec. 31	751.5	503	+12	+4.5
Calendar year 1967	-	-	+24	+.8
Jan. 31	751.8	523	+20	+7.5
Feb. 29	751.2	485	-38	-15.2
Mar. 31	752.2	551	+66	+24.6
Apr. 30	754.5	727	+176	+67.9
May 31	755.6	824	+97	+36.2
June 30	755.3	797	-27	-10.4
July 31	753.4	639	-158	-59.0
Aug. 31	751.9	530	-109	-40.7
Sept. 30	749.7	395	-135	-52.1
Water year 1967-68	-	-	+6	+.2

‡ Elevation at 2400.

4-1475. Flint River near Otisville, Mich.

Location.--Lat 43°06'40", long 83°31'10", in SE1/4 sec.9, T.8 N., R.8 E., on left bank 20 ft downstream from bridge on State Highway 15, 1 1/2 miles downstream from Holloway Reservoir, 3 1/2 miles upstream from Powers-Cullen drain, and 3 3/4 miles south of Otisville.

Drainage area.--547 sq mi.

Records available.--October 1952 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 721.39 ft above mean sea level, datum of 1929.

Average discharge.--16 years, 263 cfs (adjusted for storage since 1954).

Extremes.--Maximum discharge during year, 4,370 cfs Feb. 5 (gage height, 13.94 ft); minimum, 57 cfs Oct. 5, 6 (gage height, 2.55 ft).
1952-68: Maximum discharge, 6,150 cfs Apr. 1, 1960 (gage height, 14.97 ft); minimum, 4.3 cfs Oct. 28, 1960 (gage height, 1.81 ft).

Remarks.--Records good. Flow regulated by Holloway Reservoir 1 1/2 miles above station (see preceding page).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	143	275	189	343	1,030	186	1,260	153	802	1,100	111	120
2	141	304	182	272	2,200	184	1,080	184	713	1,000	111	120
3	141	350	178	254	3,610	182	937	213	665	900	111	120
4	143	406	170	247	4,210	181	838	226	577	800	111	120
5	94	456	168	240	4,160	191	811	231	494	700	111	120
6	58	490	176	209	3,440	220	753	224	400	600	111	120
7	60	506	201	200	2,620	245	806	222	350	500	111	120
8	60	482	238	190	2,060	280	656	202	250	400	111	130
9	60	452	294	177	1,610	364	443	195	220	300	113	130
10	60	408	352	166	1,140	487	287	200	200	200	120	130
11	60	372	436	162	740	595	355	197	190	170	120	130
12	60	340	580	149	650	667	359	181	180	140	120	130
13	60	350	716	153	580	609	362	186	170	120	120	130
14	60	360	810	172	528	559	350	193	160	110	120	130
15	60	386	852	175	467	551	400	182	150	110	119	130
16	61	382	814	157	418	569	350	188	150	105	119	130
17	60	368	746	149	377	632	320	229	150	103	119	130
18	60	342	664	149	335	704	300	267	150	103	117	132
19	60	346	584	153	298	762	260	283	150	105	120	134
20	61	364	516	162	269	810	220	292	150	105	120	132
21	61	372	524	172	253	827	190	321	150	105	120	132
22	64	360	652	181	229	811	160	335	150	105	120	132
23	86	337	798	190	213	949	134	350	150	105	120	132
24	124	325	878	199	202	1,130	134	341	150	105	120	134
25	120	306	954	197	195	1,270	136	301	889	107	120	134
26	129	273	876	195	188	1,260	136	298	1,080	113	120	132
27	158	264	726	197	182	907	136	339	1,070	113	120	132
28	186	242	618	209	190	710	136	451	1,000	111	120	132
29	224	219	539	260	186	1,200	134	609	1,100	111	120	130
30	250	203	467	508	------	1,490	132	692	1,200	111	120	130
31	267	------	409	681	------	1,430	------	811	------	111	120	------
TOTAL	3,231	10,640	16,307	6,868	32,580	20,962	12,575	9,096	13,210	8,868	3,635	3,858
MEAN	104	355	526	222	1,123	676	419	293	440	286	117	129
MAX	267	506	954	681	4,210	1,490	1,260	811	1,200	1,100	120	134
MIN	58	203	168	149	182	181	132	153	150	103	111	120
+	+38.1	0	+4.5	+7.5	-15.2	+24.6	+67.9	+36.2	-10.4	-59.0	-40.7	-52.1
MEAN‡	142	355	530	230	1,108	701	487	329	430	227	76.3	76.9
CFSM‡	.26	.65	.97	.42	2.03	1.28	.89	.60	.79	.41	.14	.14
IN‡	.30	.72	1.12	.48	2.18	1.48	.99	.69	.88	.48	.16	.16

CAL YR 1967: TOTAL 146,905 MEAN 402 MAX 2,590 MIN 49 MEAN‡ 403 CFSM‡ .74 IN‡ 9.99
WAT YR 1968: TOTAL 141,830 MEAN 388 MAX 4,210 MIN 58 MEAN‡ 388 CFSM‡ .71 IN‡ 9.66

\+ Change in contents, equivalent in cubic feet per second, in Holloway Reservoir, furnished by City of Flint.
‡ Adjusted for change in contents in Holloway Reservoir.

GPO 817-436-12

4-1481.4. Kearsley Creek near Davison, Mich.

Location.--Lat 43°02'01", long 83°34'53", in NE1/4 sec.12, T.7 N., R.7 E., on right bank 10 ft upstream from bridge on State Highway 21, 1.4 miles downstream from Black Creek, and 3.3 miles west of Davison.

Drainage area.--98.8 sq mi.

Records available.--October 1965 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 760 ft (from topographic map).

Extremes.--Maximum discharge during year, 707 cfs Feb. 2 (gage height, 10.29 ft); minimum, 5.2 cfs June 20 (gage height, 2.83 ft).
1965-68: Maximum discharge, that of Feb. 2, 1968; minimum, 2.7 cfs July 9, 1966; minimum gage height, 2.82 ft Sept. 14, 1966.

Remarks.--Records good except those for the winter period, which are fair. Some diurnal fluctuation caused by small dams, and occasional diversion for sprinkler irrigation above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	19	41	28	58	500	32	204	42	112	276	16	9.5
2	21	57	28	52	690	33	170	40	84	184	13	15
3	21	49	29	48	599	34	146	40	69	132	13	13
4	18	63	30	45	572	35	155	39	47	93	13	11
5	16	62	31	41	617	38	141	36	42	66	12	12
6	13	66	34	38	543	42	132	35	38	64	12	12
7	13	66	45	36	476	47	128	33	28	87	24	13
8	12	60	56	34	350	54	86	31	21	48	17	13
9	15	55	66	33	250	72	76	30	20	42	15	12
10	14	47	87	32	180	84	72	28	19	30	14	15
11	19	47	135	31	130	96	68	28	19	28	14	16
12	20	48	174	31	100	100	63	28	18	28	15	18
13	19	46	148	31	90	93	57	26	16	27	13	20
14	19	47	170	30	80	91	47	30	15	24	12	24
15	17	48	155	30	70	80	55	30	19	21	11	24
16	23	49	136	30	64	100	52	30	15	19	9.5	22
17	27	50	115	30	58	113	58	30	13	18	41	21
18	42	50	88	30	54	114	84	32	13	18	28	17
19	44	48	74	30	50	126	88	41	15	17	39	15
20	52	44	76	31	46	129	64	42	13	15	49	19
21	53	44	158	32	43	135	60	48	14	13	50	16
22	49	44	270	32	40	132	52	52	15	12	50	17
23	42	44	192	33	37	138	43	51	12	12	33	20
24	34	42	211	35	35	132	42	46	13	15	20	21
25	28	41	250	36	34	133	62	36	48	12	16	22
26	24	39	200	38	33	366	66	31	168	9.5	15	23
27	27	36	150	41	32	354	66	54	199	9.5	12	35
28	33	33	120	50	32	295	73	119	208	19	9.3	36
29	30	30	100	100	32	296	62	128	261	14	7.8	24
30	38	28	80	140	------	266	59	136	362	14	7.6	19
31	39	------	66	350	------	249	------	137	------	18	7.4	------
TOTAL	841	1,424	3,502	1,608	5,837	4,009	2,531	1,509	1,936	1,385.0	608.6	554.5
MEAN	27.1	47.5	113	51.9	201	129	84.4	48.7	64.5	44.7	19.6	18.5
MAX	53	66	270	350	690	366	204	137	362	276	50	36
MIN	12	28	28	30	32	32	42	26	12	9.5	7.4	9.5
CFSM	.27	.48	1.14	.53	2.04	1.31	.85	.49	.65	.45	.20	.19
IN.	.32	.54	1.32	.61	2.20	1.51	.95	.57	.73	.52	.23	.21

CAL YR 1967: TOTAL 29,870.4 MEAN 81.8 MAX 579 MIN 7.0 CFSM .83 IN 11.24
WAT YR 1968: TOTAL 25,745.1 MEAN 70.3 MAX 690 MIN 7.4 CFSM .71 IN 9.69

PEAK DISCHARGE (BASE, 250 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-22	0500	6.81	298	03-26	2400	8.22	450
12-25	1900	6.48	263	06-30	0630	7.54	380
02-02	1100	10.29	707				

4-1482. Swartz Creek near Holly, Mich.

Location.—Lat 42°49'40", long 83°37'40", in SW¼ sec.15, T.5 N., R.7 E., on right bank 25 ft downstream from bridge on Elliott Road and 2½ miles north of Holly.

Drainage area.—11.9 sq mi.

Records available.—January 1956 to September 1968.

Gage.—Water-stage recorder. Altitude of gage is 905 ft (from topographic map).

Average discharge.—12 years, 6.04 cfs.

Extremes.—Maximum discharge during year, 91 cfs Feb. 4 (gage height, 3.69 ft); minimum, 1.2 cfs sometime during period July 17 to Aug. 8 (gage height, 1.65 ft).
1956-68: Maximum discharge, 91 cfs Feb. 4, 1968 (gage height, 3.69 ft); minimum, 0.10 cfs on many days in 1963, 1964, and 1965.

Remarks.—Records good except those for the winter period and those for period of no gage-height record, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	3.2	7.1	4.3	8.4	42	3.5	23	7.0	9.3	22	1.9	2.5
2	3.2	10	4.1	8.0	65	3.5	21	6.6	8.4	18	1.7	3.8
3	2.8	11	4.5	7.4	69	3.6	19	6.2	7.2	14	1.6	3.6
4	2.6	13	4.3	7.0	69	3.7	17	6.0	6.5	11	1.5	3.4
5	2.4	12	4.5	6.4	57	3.7	16	5.8	5.6	8.7	1.5	3.2
6	2.1	10	5.1	6.0	43	4.0	15	5.4	5.0	7.4	1.6	3.0
7	2.0	9.2	6.6	5.4	34	4.2	14	5.0	4.6	6.8	2.0	2.6
8	2.1	8.3	7.6	5.0	27	4.5	13	4.6	4.2	6.2	3.0	2.5
9	3.3	7.8	7.6	4.8	20	6.5	12	4.5	3.8	5.6	4.2	2.3
10	3.3	7.1	8.0	4.8	16	8.1	11	4.4	3.5	6.4	4.0	2.6
11	3.2	7.8	12	4.8	13	8.1	10	4.4	3.2	5.6	3.4	2.6
12	3.0	8.8	17	4.6	11	7.9	9.3	4.4	3.1	5.0	3.0	2.5
13	2.8	8.0	16	4.6	10	7.6	8.1	4.5	4.5	4.4	2.6	2.3
14	2.8	7.8	13	5.0	9.0	7.0	7.6	4.6	4.1	3.9	2.5	2.2
15	3.0	7.8	11	5.2	8.0	7.4	11	5.0	3.7	3.6	2.2	2.0
16	5.1	6.8	9.5	5.2	7.0	10	10	5.6	3.5	3.3	3.5	1.9
17	7.6	6.4	8.5	5.0	6.4	14	10	6.0	3.2	3.1	19	1.7
18	9.2	8.0	8.5	5.0	6.0	15	9.6	5.6	3.0	2.9	15	1.7
19	8.5	8.3	8.8	5.0	5.4	15	9.0	5.2	2.8	3.5	16	1.7
20	7.6	7.6	8.3	5.0	5.0	17	8.8	5.2	2.5	6.0	16	2.5
21	6.8	7.1	26	5.0	5.0	18	8.6	5.0	2.4	3.5	12	2.6
22	5.8	7.1	45	5.0	4.5	17	8.2	5.0	2.4	3.0	10	3.0
23	5.3	7.3	43	5.0	4.2	16	8.0	5.0	2.4	3.5	7.9	3.6
24	4.9	6.8	36	4.8	4.0	14	8.0	5.0	2.6	3.3	6.5	4.4
25	4.7	6.6	30	4.8	3.8	17	8.5	5.0	3.0	3.0	5.6	5.2
26	4.3	6.2	25	4.6	3.7	23	9.0	6.4	10	2.6	4.4	4.8
27	6.0	5.8	20	4.5	3.5	34	9.0	8.0	30	2.3	3.8	4.6
28	8.3	5.2	16	7.0	3.5	32	8.6	11	28	2.4	3.2	4.0
29	8.3	4.8	13	11	3.5	30	8.0	13	26	2.5	2.8	3.4
30	7.6	4.5	11	16	------	27	7.6	12	24	2.4	2.5	3.2
31	6.8	------	10	24	------	25	------	10	------	2.1	2.3	------
TOTAL	148.6	234.2	444.2	204.3	558.5	407.3	337.9	191.4	222.5	178.0	167.2	85.4
MEAN	4.79	7.81	14.3	6.59	19.3	13.1	11.3	6.17	7.42	5.74	5.39	2.98
MAX	9.2	13	45	24	69	34	23	13	30	22	19	5.2
MIN	2.0	4.5	4.1	4.5	3.5	3.5	7.6	4.4	2.4	2.1	1.5	1.7
CFSM	.40	.66	1.20	.55	1.62	1.10	.95	.52	.62	.48	.45	.25
IN.	.46	.73	1.39	.64	1.75	1.27	1.06	.60	.70	.56	.52	.28

CAL YR 1967: TOTAL 3,516.7 MEAN 9.63 MAX 73 MIN 1.1 CFSM .81 IN 10.99
WAT YR 1968: TOTAL 3,183.5 MEAN 8.70 MAX 69 MIN 1.5 CFSM .73 IN 9.95

Note.—No gage-height record July 7 to Aug. 8,

4-1485. Flint River near Flint, Mich.

Location.--Lat 43°02'20", long 83°46'10", in SW1/4 sec.4, T.7 N., R.6 E., on left bank on grounds of sewage-treatment plant, 1 mile upstream from Pirnie Creek, 2 miles downstream from Flint, and 5 miles downstream from Swartz Creek.

Drainage area.--927 sq mi.

Records available.--September 1903 to March 1904 (gage heights only), August 1932 to September 1968. Gage-height records for flood seasons collected in this vicinity 1911-32, are contained in reports of U. S. Weather Bureau.

Gage.--Digital water-stage recorder. Datum of gage is 678.80 ft above mean sea level (levels by U. S. Weather Bureau and City of Flint). Prior to Aug. 11, 1964, graphic water-stage recorder at same site and datum.

Average discharge.--36 years, 536 cfs (adjusted for storage since 1954).

Extremes.--Maximum discharge during year, 7,220 cfs Feb. 2 (gage height, 12.11 ft); minimum, 83 cfs Oct. 8 (gage height, 2.51 ft).
1932-68: Maximum discharge, 14,900 cfs Apr. 6, 1947 (gage height, 16.35 ft); minimum, 9.0 cfs Aug. 7, 1934.

Remarks.--Records good. Some regulation by reservoirs above station. City of Flint diverts water above station for municipal and industrial use, but sewage from city is included in flow at station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	219	438	324	564	3,510	377	2,050	398	1,230	1,950	299	247
2	202	552	313	543	6,770	374	1,750	403	1,150	1,840	244	289
3	199	548	324	512	5,960	350	1,550	430	1,010	1,700	224	269
4	196	675	299	485	5,590	378	1,570	432	895	1,530	218	260
5	190	650	295	416	5,540	397	1,460	455	725	1,310	224	269
6	131	660	309	424	5,670	417	1,350	434	630	960	232	254
7	101	674	355	389	4,980	435	1,250	424	472	845	276	244
8	120	655	394	372	3,710	477	982	420	594	740	254	232
9	172	616	433	376	2,940	612	977	400	382	544	241	247
10	123	584	580	361	2,140	777	666	392	367	316	232	313
11	116	620	907	342	1,480	909	637	377	349	403	218	309
12	118	588	1,340	319	1,160	978	654	361	334	338	224	269
13	122	530	1,150	315	847	942	626	357	313	286	227	266
14	140	544	1,090	316	790	860	774	440	295	263	227	257
15	136	562	1,240	350	803	849	915	406	356	263	221	247
16	266	539	1,180	325	744	901	696	394	289	269	367	254
17	260	530	984	315	658	973	523	393	289	250	1,480	254
18	250	548	926	322	587	1,070	509	433	279	270	566	250
19	190	530	882	380	556	1,210	461	544	302	279	506	269
20	176	526	814	335	530	1,300	451	527	292	231	418	363
21	167	522	1,500	347	467	1,340	529	549	272	217	356	269
22	176	526	1,900	372	464	1,320	472	577	292	228	338	250
23	174	518	1,610	393	443	1,370	450	573	260	232	327	272
24	198	490	1,510	372	412	1,520	450	571	276	295	302	324
25	392	466	1,510	386	382	1,800	454	526	765	232	269	309
26	352	446	1,410	400	382	3,130	447	547	1,730	221	260	279
27	434	422	1,200	412	380	3,060	434	812	1,940	360	269	266
28	342	385	1,080	656	388	2,010	407	1,160	1,790	334	272	266
29	295	356	938	1,420	383	1,870	413	1,120	2,190	266	272	254
30	338	342	853	2,470	------	2,110	410	1,130	2,240	244	316	247
31	338	------	752	1,910	------	2,190	------	1,130	------	272	257	------
TOTAL	6,633	16,042	28,402	16,899	58,666	36,306	24,317	17,115	22,308	17,488	10,136	8,098
MEAN	214	535	916	545	2,023	1,171	811	552	744	564	327	270
MAX	434	675	1,900	2,470	6,770	3,130	2,050	1,160	2,240	1,950	1,480	363
MIN	101	342	295	315	380	350	407	357	260	217	218	232
+	+38.1	0	+4.5	+7.5	-15.2	+24.6	+67.9	+36.2	-10.4	-59.0	-40.7	-52.1
MEAN‡	252	535	920	552	2,008	1,196	879	588	734	505	286	218
CFSM‡	.27	.58	.99	.60	2.17	1.29	.95	.63	.79	.54	.31	.24
IN.‡	.31	.64	1.14	.69	2.34	1.49	1.06	.73	.88	.63	.36	.26

CAL YR 1967: TOTAL 261,822 MEAN 717 MAX 4,880 MIN 72 MEAN‡ 718 CFSM‡ .77 IN.‡ 10.49
WTR YR 1968: TOTAL 262,410 MEAN 717 MAX 6,770 MIN 101 MEAN‡ 717 CFSM‡ .77 IN.‡ 10.53

\+ Change in contents, equivalent in cubic feet per second in Holloway Reservoir; furnished by City of Flint.
‡ Adjusted for change in contents in Holloway Reservoir.

4-1490. Flint River near Fosters, Mich.

Location.—Lat 43°17'56", long 83°55'58", on west line of sec.6, T.10 N., R.5 E., on downstream side of bridge on Sheridan Road, 1 mile west of Fosters, 1½ miles upstream from Birch Run, and 4 miles downstream from Silver Creek.

Drainage area.—1,120 sq mi, approximately.

Records available.—October 1939 to September 1968. Monthly discharge only for some periods, published in WSP 1307. Gage-height records for flood seasons collected in this vicinity 1910-20, 1922-27 are contained in reports of U. S. Weather Bureau.

Gage.—Wire-weight gage read twice daily. Datum of gage is 582.22 ft above mean sea level, unadjusted (levels by U. S. Weather Bureau). Prior to August 1943, chain gage at same site and datum.

Average discharge.—29 years, 679 cfs.

Extremes.—Maximum discharge during year, 11,500 cfs Feb. 2 (gage height, 18.6 ft); minimum, 99 cfs Oct. 13 (gage height, 3.76 ft).
1939-68: Maximum discharge, 19,000 cfs Apr. 7, 1947 (including flow bypassing gage); maximum gage height, 18.6 ft Feb. 2, 1968; minimum discharge observed, 27 cfs Aug. 6, 1941; minimum gage height observed, 3.28 ft Aug. 11, 1964.
Flood of March 1904 reached a stage of 18.4 ft (from U. S. Weather Bureau data).

Remarks.—Records good except those for the winter period, which are fair. Some regulation by reservoirs above Flint.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	192	421	416	900	2,500	450	2,500	462	1,320	2,780	334	292
2	210	645	391	700	9,300	450	2,430	471	1,370	2,240	298	332
3	208	645	353	500	7,200	450	1,830	490	1,220	2,030	249	315
4	194	811	338	480	5,820	440	1,780	522	1,120	1,760	196	253
5	199	795	353	460	5,650	450	1,790	538	922	1,570	226	265
6	196	668	347	440	5,570	470	1,550	505	752	1,240	236	273
7	143	673	371	420	5,460	500	1,470	502	640	1,010	267	253
8	115	692	378	400	5,020	520	1,370	481	481	914	321	273
9	121	679	360	390	3,750	580	1,120	471	568	816	271	246
10	203	624	486	380	3,100	700	1,060	442	433	471	251	311
11	138	546	1,040	380	2,200	1,100	757	433	412	476	240	300
12	118	645	1,790	370	1,600	1,230	784	438	410	462	251	358
13	112	647	1,790	370	1,300	1,240	741	430	378	373	232	253
14	133	578	1,340	370	1,100	1,160	744	495	347	338	232	269
15	157	611	1,360	370	1,000	975	1,340	500	330	304	185	294
16	170	570	1,350	370	900	849	986	459	387	300	225	271
17	210	556	1,260	370	800	1,100	843	459	313	294	1,430	286
18	351	556	1,220	370	740	1,160	647	440	306	292	1,290	249
19	283	590	1,270	370	700	1,220	660	519	309	334	580	286
20	232	586	989	380	650	1,410	588	634	340	288	601	430
21	196	563	1,000	390	620	1,480	624	614	313	257	483	690
22	189	543	2,760	400	580	1,530	601	632	334	247	410	334
23	199	573	2,280	410	560	1,380	583	640	332	251	389	265
24	203	558	1,720	420	520	1,690	573	616	290	263	373	302
25	213	536	1,640	440	500	1,840	568	611	347	315	336	371
26	412	531	1,630	460	470	3,000	560	524	1,900	255	298	321
27	378	384	1,500	480	460	4,900	543	757	3,020	244	300	292
28	586	410	1,400	520	450	3,500	519	1,610	2,670	598	306	271
29	407	438	1,300	900	450	2,500	486	1,610	2,240	330	302	279
30	371	452	1,100	2,300	------	2,240	505	1,370	3,360	279	328	251
31	384	------	1,000	3,500	------	2,480	------	1,330	------	259	349	------
TOTAL	7,223	17,526	34,532	19,010	68,970	42,994	30,552	20,005	27,164	21,590	11,789	9,185
MEAN	233	584	1,114	613	2,378	1,387	1,018	645	905	696	380	306
MAX	586	811	2,760	3,500	9,300	4,900	2,500	1,610	3,360	2,780	1,430	690
MIN	112	384	338	370	450	440	486	430	290	244	185	246

CAL YR 1967: TOTAL 323,212 MEAN 886 MAX 6,980 MIN 103 IN 10.73
WAT YR 1968: TOTAL 310,540 MEAN 848 MAX 9,300 MIN 112 IN 10.31

4-1495. Flint River near Alicia, Mich.

Location.--Lat 43°18'40", long 84°02'00", in SE1/4 sec.31, T.11 N., R.4 E., on left bank 100 ft downstream from the Prairie Farms Association flood-pumping station, 2 3/4 miles north of Alicia, and 4 miles upstream from mouth.

Records available.--November 1948 to September 1968 (gage heights only).

Gage.--Water-stage recorder. Datum of gage is 577.00 ft above mean sea level, datum of 1929.

Extremes.--Maximum gage height during year, 11.40 ft Feb. 4; minimum, less than 1.5 ft on many days.
1948-68: Maximum gage height, 13.70 ft Apr. 3, 1960; minimum, less than 1.5 ft during many days in 1949, 1958, 1959, 1963, 1964, 1966-68.

Remarks.--Records represent stages in the Shiawassee Flats area.

Mean gage height, in feet, water year October 1967 to September 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.50	2.66	2.34	3.40	7.70	2.60	5.96	3.12	6.69	6.99	3.46	3.04
2	2.18	2.49	2.40	3.21	9.93	2.79	5.46	2.73	5.90	6.50	3.03	2.70
3	2.32	3.17	2.75	3.20	11.12	2.71	5.03	3.34	5.27	6.02	3.01	3.18
4	2.23	3.00	2.18	3.05	11.38	2.50	4.46	2.93	4.68	5.46	3.19	3.16
5	2.75		2.37	3.03	11.38	2.74	4.59	3.08	4.06	5.08	2.91	2.95
6	3.15	2.90	2.38	3.00	11.37	2.77	4.51	2.88	3.67	4.70	3.03	2.94
7	2.51		2.46			2.68	4.21	2.66	3.42	4.17	3.32	3.27
8	1.84		2.56			2.64	3.55	2.37	3.25	3.91	3.28	3.00
9	1.71		3.26			3.06	3.18	2.56	3.02	3.72	3.31	3.12
10	2.20		3.23			3.57	3.42	2.95	3.37	4.18	3.65	3.34
11	2.34		3.04			4.01	2.97	2.89	3.00	3.62	3.44	3.94
12	2.34		4.65			4.07	2.55	2.84	2.91	3.42	3.20	3.44
13	1.80	3.24	5.67			3.82	2.78	2.65	3.61	3.20	2.85	3.36
14	2.06	3.21	6.25	2.62		3.38	2.59	2.54	2.66	2.95	3.23	3.18
15	2.38	3.62	6.04	2.85		2.87	3.30	2.56	3.12	2.96	3.44	3.26
16	2.46	2.68	5.38		4.01	3.09	3.65	2.33	3.23	3.01	2.98	3.14
17	2.53	2.68	4.55		3.83	3.34	3.28	2.45	2.94	3.03	3.47	3.06
18	2.63	2.75	3.88	2.37		3.41	3.27	3.12	2.65	2.71	5.00	2.97
19	2.95	2.97	3.46	2.46		3.50	3.33	2.76	2.84	3.30	4.37	3.00
20	2.04	2.94	3.40	2.64		3.63	3.25	3.06	3.15	3.13	3.90	3.00
21	2.35	2.74	3.25	2.60		3.84	2.73	3.14	2.71	2.94	3.92	3.57
22	2.30	2.54	4.62	2.43		3.82	3.02	3.06	2.83	2.97	3.50	3.55
23	2.40	2.57	5.28	2.67		4.05	3.02	3.05	2.90	3.30	3.49	3.38
24		2.38	5.03	2.63		3.82	2.24	3.30	2.94	3.05	3.15	3.19
25		2.44	4.58	2.48		3.47	2.73	3.26	3.66	3.41	3.13	3.20
26	1.90	2.04	4.28	2.37		4.71	3.13	2.99	4.96	3.20	3.86	3.40
27	3.37	2.18	4.37	2.55		7.07	3.27	3.43	6.07	2.93	3.60	3.29
28	2.57	2.37	4.20	2.51	2.63	7.58	3.05	5.37	6.55	3.32	3.44	3.50
29		2.60	3.92	2.86	2.74	7.45	2.67	6.73	6.61	3.39	3.34	3.46
30	2.25	2.70	3.55	5.51	------	6.97	3.02	7.37	6.89	3.08	3.24	3.05
31		------	3.48	7.24	------	6.41	------	7.37	------	2.75	3.20	------

4-1500. South Branch Cass River near Cass City, Mich.

Location.--Lat 43°34'01", long 83°06'43", in SW 1/4 NW 1/4 sec.7, T.13 N., R.12 E., on left bank 1.5 miles downstream from bridge on State Highway 53, 3.9 miles southeast of Cass City, 4.2 miles upstream from confluence with North Branch.

Drainage area.--251 sq mi.

Records available.--October 1948 to September 1968. Prior to October 1963, published as East Branch Cass River near Cass City. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Water-stage recorder. Datum of gage is 719.5 ft above mean sea level, datum of 1929. Prior to Nov. 8, 1952, wire-weight gage at site 1.5 miles upstream at different datum.

Average discharge.--20 years, 121 cfs.

Extremes.--Maximum discharge during year, 5,200 cfs Feb. 2 (gage height, 14.54 ft); minimum, 4.4 cfs Aug. 30, 31, Sept. 1, 9.
1948-68: Maximum discharge, 6,400 cfs Mar. 28, 1967 (gage height, 14.86 ft); minimum, 0.2 cfs Sept. 20-23, 1955, Aug. 19, 20, 1958.

Remarks.--Records good except those for the winter periods, which are fair.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	25	107	60	45	700	47	282	56	230	250	8.0	4.6
2	22	681	56	40	4,500	47	212	50	220	153	12	5.2
3	18	722	55	35	3,000	47	167	43	172	101	11	5.5
4	16	1,050	58	32	2,000	48	167	43	119	74	9.2	5.5
5	14	670	60	30	1,300	50	248	43	87	52	8.4	5.2
6	12	310	64	28	700	55	183	40	67	54	8.8	4.8
7	12	198	105	27	500	60	141	37	56	85	11	5.5
8	12	151	302	25	420	70	116	34	43	42	11	5.0
9	24	126	270	25	350	100	98	44	40	35	11	4.6
10	39	108	192	25	300	250	84	48	400	101	9.6	5.5
11	27	113	1,260	25	250	350	74	41	148	51	8.0	19
12	21	232	2,330	25	220	250	67	41	136	31	8.0	24
13	17	342	1,460	25	190	240	60	44	101	23	7.7	14
14	17	248	628	25	160	190	60	44	66	19	7.2	8.8
15	17	200	300	26	130	170	160	136	43	16	6.6	7.2
16	23	160	240	27	110	194	126	198	32	13	6.6	6.3
17	48	170	190	28	90	340	90	119	25	14	6.3	5.2
18	141	592	160	28	85	390	90	87	21	14	6.6	5.0
19	132	964	151	29	75	388	95	73	21	22	7.2	5.0
20	101	434	141	30	68	382	80	129	22	19	8.8	5.5
21	70	228	572	31	64	360	81	126	20	14	9.6	5.5
22	51	181	2,030	32	58	264	84	100	34	12	7.2	5.2
23	39	190	750	33	54	143	77	81	35	10	6.0	5.2
24	33	165	300	33	52	115	123	63	24	10	5.8	5.5
25	30	141	200	33	50	120	124	50	57	11	5.5	6.0
26	29	131	140	32	48	1,490	102	41	1,120	11	5.2	6.3
27	66	108	100	31	47	3,400	84	60	1,660	10	5.2	6.0
28	646	84	95	33	47	1,430	66	803	1,170	10	4.8	5.2
29	338	74	75	36	47	750	57	945	534	8.8	4.6	5.0
30	174	66	65	120	------	430	57	665	378	8.4	4.6	5.0
31	123	------	55	300	------	292	------	370	------	8.0	4.6	------
TOTAL	2,337	8,946	12,464	1,294	15,615	12,462	3,455	4,654	7,081	1,282.2	236.1	206.3
MEAN	75.4	298	402	41.7	538	402	115	150	236	41.4	7.62	6.88
MAX	646	1,050	2,330	300	4,500	3,400	282	945	1,660	250	12	24
MIN	12	66	55	25	47	47	57	34	20	8.0	4.6	4.6
CFSM	.300	1.19	1.60	.166	2.14	1.60	.458	.598	.940	.165	.030	.027
IN	.35	1.33	1.85	.19	2.31	1.85	.51	.69	1.05	.19	.03	.03

CAL YR	1967	TOTAL	86,070.0	MEAN	236	MAX	5,760	MIN	7.7	CFSM	.940	IN	12.75
WTR YR	1968	TOTAL	70,032.6	MEAN	191	MAX	4,500	MIN	4.6	CFSM	.761	IN	10.38

PEAK DISCHARGE (BASE, 1,100 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
11-04	1400	6.98	1,190	02-02	1700	14.54	5,200
11-19	0530	6.76	1,110	03-27	0300	12.27	4,390
12-12	1430	9.57	2,550	05-28	2230	7.15	1,240
12-22	0730	9.35	2,420	06-27	1500	8.63	1,950

4-1505. Cass River at Cass City, Mich.

Location.--Lat 43°35'03", long 83°10'34", in NE 1/4 NE 1/4 sec.4, T.13 N., R.11 E., on left bank 600 ft downstream from bridge on Cemetery Road, 0.3 mile downstream from confluence of North and South Branch, and 1.1 miles south of Cass City.

Drainage area.--370 sq mi, approximately.

Records available.--October 1947 to September 1968. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Water-stage recorder. Datum of gage is 697.92 ft above mean sea level, datum of 1929. Prior to Nov. 14, 1952, wire-weight gage at site 600 ft upstream at same datum.

Average discharge.--21 years, 194 cfs.

Extremes.--Maximum discharge during year, 6,400 cfs Feb. 2 (gage height, 14.83 ft); minimum, 6.8 cfs Aug. 31 (gage height, 4.47 ft).
1948-68: Maximum discharge, 8,460 cfs Mar. 20, 1948 (gage height, 15.80 ft, from graph based on gage readings), site then in use; minimum, 0.5 cfs Sept. 26, 1948.

Remarks.--Records good except those for the winter periods, which are fair.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	35	191	135	90	1,100	60	594	117	450	510	17	7.6
2	32	762	130	80	5,000	60	462	109	400	333	18	8.5
3	29	900	120	72	3,800	62	378	100	320	222	19	9.5
4	27	1,270	115	65	2,700	62	350	96	233	160	17	9.5
5	24	975	113	60	2,100	64	418	91	183	121	15	10
6	21	586	117	56	1,600	68	337	80	146	104	15	9.5
7	20	434	162	53	950	75	276	72	126	139	17	9.0
8	23	323	375	51	700	90	233	68	108	89	17	10
9	35	248	396	50	500	110	193	70	94	72	17	9.0
10	56	210	340	50	400	240	167	76	511	121	17	9.5
11	45	202	1,340	50	350	600	148	70	293	89	15	17
12	35	346	2,720	50	300	450	132	70	270	66	14	27
13	29	502	2,280	50	250	350	117	74	207	60	14	21
14	26	446	1,290	50	220	300	119	76	146	50	13	17
15	26	400	800	52	190	270	242	139	119	40	12	16
16	30	330	500	53	150	260	216	258	100	35	12	15
17	52	333	380	54	130	280	176	171	82	30	12	14
18	140	672	330	56	110	400	176	137	70	35	12	12
19	210	1,250	303	58	100	420	176	121	64	58	12	12
20	180	743	267	60	90	430	157	174	64	62	12	12
21	120	550	613	62	82	420	157	178	56	46	15	12
22	90	450	2,300	64	76	350	160	153	64	48	13	11
23	70	389	900	66	72	250	150	132	70	38	12	10
24	58	337	560	66	70	220	213	113	58	32	9.5	10
25	52	296	350	65	64	250	216	94	95	29	9.0	11
26	49	273	250	63	62	1,300	199	78	1,210	26	9.0	12
27	60	236	180	62	62	4,100	169	104	1,850	25	8.5	11
28	660	190	160	64	62	2,580	146	852	1,530	23	8.5	10
29	416	170	140	150	60	1,640	124	1,140	830	21	8.0	10
30	273	140	130	300	------	1,000	128	905	655	18	7.6	9.0
31	228	------	100	600	------	690	------	614	------	17	7.2	------
TOTAL	3,151	14,154	17,896	2,722	21,350	17,451	6,729	6,532	10,404	2,719	404.3	361.1
MEAN	102	472	577	87.8	736	563	224	211	347	87.7	13.0	12.0
MAX	660	1,270	2,720	600	5,000	4,100	594	1,140	1,850	510	19	27
MIN	20	140	100	50	60	60	117	68	56	17	7.2	7.6
CFSM	.276	1.28	1.56	.237	1.99	1.52	.605	.570	.938	.237	.035	.032
IN	.32	1.42	1.80	.27	2.15	1.75	.68	.66	1.05	.27	.04	.04

CAL YR	1967	TOTAL	132,460	MEAN	363	MAX	7,700	MIN	10	CFSM	.981	IN 13.31
WTR YR	1968	TOTAL	103,873.4	MEAN	284	MAX	5,000	MIN	7.2	CFSM	.768	IN 10.44

PEAK DISCHARGE (BASE, 1,400 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
11-04	1600	8.49	1,440	03-27	0900	12.2	4,500
12-12	1730	10.55	3,000	05-29	0030	8.35	1,410
12-22	0930	10.09	2,630	06-27	1730	9.56	2,190
02-02	1730	14.83	6,400				

4-1510. Csss River at Vassar, Mich.

Location.--Lat 43°22'10", long 83°34'55", in SW 1/4 sec.7, T.11 N., R.8 E., on downstream side of bridge on State Highwsy 15 in Vsssar, 1 1/4 miles upstresm from Goodings Creek.

Drainsge area.--700 sq mi, approximately.

Records available.--October 1948 to September 1968. Monthly dischsrge only for some periods, published in WSP 1307. Gage-height records for flood seasons collected in this vicinity 1910-28 are contained in reports of U. S. Weather Bureau.

Gage.--Wire-weight gage read twice daily, and crest-stage gage above concrete dam. Datum of gage is 612.376 ft above mean sea level, datum of 1929 (levels by U. S. Weather Bureau).

Average discharge.--20 years, 382 cfs.

Extremes.--Maximum discharge during year, 8,900 cfs Feb. 3 (gage height, 16.98 ft); minimum, 37 cfs Aug. 6.
1948-68: Maximum discharge, 11,400 cfs Apr. 1, 1960 (gage height, 16.70 ft); minimum, 8.6 cfs July 28, 29, 1965; minimum daily, 9.6 cfs July 29, 1965.
A stage of 20.8 ft occurred on Mar. 20, 1948, from U. S. Weather Bureau records (discharge, 18,000 cfs, from rating curve extended above 12,000 cfs by logarithmic plotting).

Remarks.--Records good except those for the winter periods, which are fair. Some regulation by dam at Michigan Sugar Co. 10 miles above station.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	125	685	280	260	3.100	155	1.490	345	1.000	990	85	44
2	118	775	270	253	4.000	146	1.040	305	870	755	81	50
3	108	1.030	260	240	8.500	128	870	272	780	550	77	50
4	93	1.640	260	210	7.000	143	820	264	590	400	74	48
5	81	2.110	268	200	4.500	149	850	256	460	332	65	46
6	74	1.280	292	180	3.690	170	830	239	350	376	44	45
7	66	960	365	170	2.000	190	700	218	284	332	44	40
8	63	770	505	170	1.300	220	595	197	288	316	41	40
9	72	670	610	160	1.100	320	515	200	236	252	44	41
10	86	550	720	160	865	500	440	250	264	404	46	42
11	105	620	1.100	160	800	1.100	385	246	735	435	47	48
12	108	800	3.480	160	700	900	350	225	510	300	50	54
13	108	960	4.250	160	600	600	310	228	485	220	52	57
14	108	995	2.850	160	460	460	300	239	350	191	52	63
15	112	920	1.480	170	400	520	500	590	260	166	52	54
16	128	800	1.060	170	355	590	695	830	218	142	52	50
17	162	695	800	180	284	760	550	800	180	126	52	48
18	194	740	710	180	253	950	540	575	162	116	50	47
19	242	1.200	650	190	242	1.120	575	565	152	191	50	47
20	256	1.120	590	200	211	1.080	520	705	149	188	50	74
21	225	940	640	210	190	1.120	480	740	143	170	51	81
22	204	870	1.120	220	170	1.000	480	600	169	135	51	59
23	169	770	2.130	220	160	810	455	485	162	122	48	56
24	155	695	1.320	220	143	475	565	390	162	116	50	52
25	143	625	955	210	134	570	700	315	190	111	42	51
26	180	575	815	210	131	2.210	630	260	1.120	102	44	50
27	232	510	645	200	137	6.370	530	360	2.740	97	44	48
28	360	440	595	210	146	6.000	435	1.370	2.950	97	42	47
29	770	360	525	500	149	3.540	370	2.590	1.860	92	42	46
30	675	300	460	700	------	2.190	355	2.070	1.210	90	41	47
31	525	------	340	2.100	------	1.420	------	1.390	------	88	41	------
TOTAL	6.047	25.405	30.345	8.733	41.720	35.906	17.875	18.119	19.029	8.002	1.604	1.525
MEAN	195	847	979	282	1,439	1,158	596	584	634	258	51.7	50.8
MAX	770	2,110	4,250	2,100	8,500	6,370	1,490	2,590	2,950	990	85	81
MIN	63	300	260	160	131	128	300	197	143	88	41	40
CFSM	.279	1.21	1.40	.403	2.06	1.65	.851	.834	.906	.369	.074	.073
IN	.32	1.35	1.61	.46	2.22	1.91	.95	.96	1.01	.43	.09	.08

CAL YR 1967 TOTAL 245,721 MEAN 673 MAX 9,950 MIN 41 CFSM .961 IN 13.05
WTR YR 1968 TOTAL 214,310 MEAN 586 MAX 8,500 MIN 40 CFSM .837 IN 11.39

PEAK DISCHARGE (BASE, 3,000 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-13	0900	10.31	4,350	03-27	2330	14.02	7,730
02-03	0600	16.98	8,900	06-28	0900	8.75	3,120

4-1515. Cass River at Frankenmuth, Mich.

Location.--Lat 43°19'40", long 83°44'53", in NW 1/4 SE 1/4 sec.27, T.11 N., R.6 E., on right bank 2,000 ft below dam in Frankenmuth, 3,600 ft above highway bridge on Dehmel Road, and 3.4 miles upstream from Dead Creek.

Drainage area.--848 sq mi.

Records available.--February 1908 to March 1909, July 1935 to September 1936, June 1939 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 583.96 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). February 1908 to March 1909 staff gage at site half a mile upstream at datum 1.81 ft lower. July 18 to Sept. 11, 1935, wire-weight gage, Sept. 12, 1935, to Sept. 30, 1936, June 20, 1939, to Sept. 30, 1949, water-stage recorder, at site half a mile downstream at datum 0.04 ft higher than present datum, and Oct. 1, 1949, to Oct. 26, 1966, graphic water-stage recorder at same site and datum.

Average discharge.--30 years (1935-36, 1939-68), 455 cfs.

Extremes.--Maximum discharge during year, 11,000 cfs Feb. 3 (gage height, 23.37 ft); minimum, 39 cfs Sept. 1. 1908-9, 1935-36, 1939-68: Maximum discharge, 17,700 cfs Mar. 18, 1942 (gage height, 20.88 ft), site and datum then in use; maximum gage height, 23.37 ft Feb. 3, 1968 (backwater from ice); minimum daily discharge, about 1.5 cfs Aug. 6, 1944.

Remarks.--Records good except those for the winter periods, which are fair. Occasional regulation by dams above station. Prior to 1950, regulation at low and medium flows by mill above station. Records of suspended sediment loads for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	151	467	300	320	3,600	180	1,540	408	1,310	1,310	101	42
2	140	650	300	290	6,000	180	1,350	365	1,110	951	96	55
3	129	1,330	299	260	10,000	180	1,110	332	954	659	92	57
4	118	1,640	299	240	8,000	185	1,010	327	734	481	90	53
5	105	2,030	305	220	5,200	190	1,050	315	560	373	88	50
6	93	1,490	332	210	4,000	200	1,010	289	441	377	117	48
7	81	1,010	411	200	2,700	220	846	261	358	360	83	46
8	75	744	545	190	1,900	270	721	239	339	325	74	43
9	79	596	650	180	1,400	350	640	240	304	279	61	43
10	88	497	770	180	1,100	700	547	274	271	334	59	49
11	93	489	1,090	180	950	1,300	483	283	713	457	58	59
12	103	672	3,380	180	820	1,100	436	253	560	323	60	65
13	100	959	4,870	190	700	900	399	248	531	244	63	65
14	96	1,050	3,660	190	600	800	400	254	407	207	64	69
15	99	966	2,170	190	500	750	624	563	314	182	61	66
16	114	824	1,360	200	420	743	828	820	261	161	61	59
17	152	677	1,040	200	360	833	691	881	231	145	63	54
18	195	704	853	210	320	1,220	641	617	205	148	58	51
19	237	1,260	784	220	290	1,310	704	570	203	184	66	52
20	264	1,690	704	220	270	1,300	644	786	204	201	68	101
21	239	1,200	827	230	250	1,330	590	865	201	181	63	111
22	208	938	2,320	240	230	1,240	584	725	265	157	59	82
23	177	820	3,470	250	220	1,020	558	568	247	138	57	69
24	160	735	1,770	245	200	643	642	456	229	132	56	65
25	148	659	1,200	240	195	653	811	364	256	131	52	62
26	144	597	878	235	185	2,180	757	309	1,120	123	46	61
27	151	547	614	230	180	6,200	660	420	3,160	115	46	59
28	266	475	587	240	180	6,990	546	1,530	3,500	109	45	57
29	950	325	562	350	180	4,320	455	2,770	2,620	107	43	54
30	780	310	436	1,100	------	2,740	424	2,470	1,700	103	42	52
31	548	------	390	2,500	------	1,860	------	1,820	------	101	42	------
TOTAL	6,283	26,351	37,176	10,130	50,950	42,087	21,701	20,622	23,308	9,098	2,034	1,799
MEAN	203	878	1,199	327	1,757	1,358	723	665	777	293	65.6	60.0
MAX	950	2,030	4,870	2,500	10,000	6,990	1,540	2,770	3,500	1,310	117	111
MIN	75	310	299	180	180	180	399	239	201	101	42	42
CFSM	.24	1.04	1.41	.39	2.07	1.60	.85	.78	.92	.35	.08	.07
IN.	.28	1.16	1.63	.44	2.23	1.85	.95	.90	1.02	.40	.09	.08

CAL YR 1967	TOTAL 276,859	MEAN 759	MAX 10,500	MIN 54	CFSM .89	IN 12.14
WTR YR 1968	TOTAL 251,539	MEAN 687	MAX 10,000	MIN 42	CFSM .81	IN 11.03

PEAK DISCHARGE (BASE, 3,500 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-13	1300	16.04	5,040	03-28	0200	18.71	7,780
12-23	0600	14.44	3,860	06-28	1300	14.00	3,600
02-03	1300	23.37	11,000				

4-1525. Tobacco River at Beaverton, Mich.

Location.--Lat 43°52'45", long 84°28'25", in sec.7, T.17 N., R.1 W., on left bank 15 ft downstream from highway bridge, 1 mile downstream from dam at Beaverton, and 2 miles upstream from Venison Creek.

Drainage area.--487 sq mi.

Records available.--July 1948 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 683.27 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Nov. 18, 1964, graphic water-stage recorder at same site and datum.

Average dischsrge.--20 years, 359 cfs.

Extremes.--Maximum discharge during year, 3,300 cfs May 28 (gage height, 8.50 ft); minimum, 88 cfs Apr. 29; minimum daily, 144 cfs Jan. 2.
1948-68: Maximum discharge, 7,680 cfs July 9, 1957 (gage height, 12.95 ft); minimum, 5.6 cfs July 12, 13, 14, 1959, Aug. 21, 1961; minimum daily, 5.9 cfs July 12, 13, 1959.

Remarks.--Records good. Prior to Feb. 21, 1961, regulation at all stages by powerplant 1 mile above station; occasional regulation since.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	260	434	256	160	1,100	220	538	292	677	604	208	159
2	250	669	256	144	1,600	220	444	290	616	436	170	169
3	228	667	257	164	2,300	210	391	276	513	335	166	182
4	225	609	256	225	1,700	202	571	273	391	289	173	188
5	219	467	253	235	1,400	235	799	270	355	278	182	204
6	183	389	288	226	1,000	275	591	266	285	272	217	198
7	183	335	380	210	700	247	498	255	343	262	226	182
8	218	327	713	210	500	260	449	237	414	197	269	174
9	269	289	540	220	388	634	382	234	480	339	259	181
10	293	284	512	240	307	886	359	240	356	449	210	269
11	279	373	515	245	253	643	353	241	333	360	187	324
12	226	573	1,560	240	230	505	330	237	357	265	173	280
13	227	632	1,890	230	230	319	315	233	307	253	177	242
14	253	431	1,230	220	220	304	293	279	278	243	187	202
15	246	428	674	220	220	298	343	328	249	225	171	190
16	304	370	562	220	220	319	382	399	230	204	171	187
17	428	326	504	220	220	418	369	355	228	208	180	185
18	330	322	457	220	215	464	350	329	224	209	187	183
19	290	421	307	225	215	564	361	320	223	225	205	231
20	269	338	378	225	210	661	346	431	242	246	213	284
21	260	345	520	225	200	676	426	505	247	235	203	296
22	243	326	660	230	196	521	465	449	254	218	178	238
23	219	316	507	230	194	433	433	336	255	208	174	208
24	229	314	398	230	203	336	588	311	265	202	172	233
25	231	305	373	220	207	390	620	294	348	200	167	280
26	231	307	348	215	204	744	504	272	734	196	161	282
27	247	303	218	215	204	935	407	619	1,790	191	159	232
28	276	261	210	210	213	798	356	2,380	2,070	198	159	203
29	291	214	205	320	222	721	212	2,610	1,140	184	158	179
30	293	245	200	520	------	544	225	1,470	841	167	158	207
31	377	------	185	720	------	609	------	982	------	193	157	------
TOTAL	8,077	11,620	15,612	7,634	15,071	14,591	12,700	16,013	15,045	8,091	5,777	6,572
MEAN	261	387	504	246	520	471	423	517	502	261	186	219
MAX	428	669	1,890	720	2,300	935	799	2,610	2,070	604	269	324
MIN	183	214	185	144	194	202	212	233	223	167	157	159
CFSM	.54	.80	1.03	.51	1.07	.97	.87	1.06	1.03	.54	.38	.45
IN.	.62	.89	1.19	.58	1.15	1.11	.97	1.22	1.15	.62	.44	.50

CAL YR 1967 TOTAL 163,594 MEAN 448 MAX 2,840 MIN 14 CFSM .92 IN 12.49
WTR YR 1968 TOTAL 136,803 MEAN 374 MAX 2,610 MIN 144 CFSM .77 IN 10.45

4-1535. Salt River near North Bradley, Mich.

Location.--Lat 43°42'10", long 84°28'15", in SE 1/4 sec.7, T.15 N., R.1 W., on right bank 200 ft upstream from bridge on North Saginaw Road, 0.5 mile upstream from Bluff Creek, and 1.1 miles southeast of North Bradley.

Drainage area.--138 sq mi.

Records available.--June 1934 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 616.01 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). June 4, 1934, to Mar. 26, 1942, staff gage at site 100 ft downstream, Mar. 27, 1942, to July 7, 1954, wire-weight gage at bridge 200 ft downstream, and July 8, 1954, to Sept. 30, 1959, water-stage recorder at present site, at datum 2.00 ft higher.

Average discharge.--34 years, 76.9 cfs.

Extremes.--Maximum discharge during year, 2,900 cfs May 28 (gage height, 13.89 ft); maximum gage height, 13.95 ft Feb. 2 (backwater from ice); minimum discharge, 10 cfs Aug. 26, 28-31, Sept. 1.
1934-68: Maximum discharge, 8,200 cfs Mar. 20, 1948 (gage height, 14.95 ft, from graph based on gage readings, site and datum then in use), from rating curve extended above 4,400 cfs; minimum observed, 1.1 cfs Aug. 14, 1944 (gage height, 0.21 ft, site and datum then in use).

Remarks.--Records good except those for the winter periods, which are fair.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	21	51	34	30	400	20	134	47	239	118	15	11
2	17	165	34	28	1,000	20	110	40	224	80	14	14
3	14	166	33	30	950	21	98	37	175	50	12	14
4	14	148	33	30	450	21	183	40	121	35	11	14
5	12	120	32	30	210	22	379	37	115	48	11	13
6	12	75	32	30	150	24	201	35	110	46	23	13
7	12	57	124	29	110	27	160	33	110	41	22	13
8	14	46	326	27	80	35	120	33	105	35	21	11
9	19	43	191	26	66	50	90	35	105	29	19	13
10	23	41	118	25	50	130	80	36	100	30	17	27
11	21	63	178	24	43	90	68	34	100	27	16	37
12	18	165	914	25	37	70	60	35	100	24	14	27
13	17	144	1,380	25	32	45	53	36	96	22	13	20
14	17	94	504	26	28	38	50	45	92	22	12	17
15	18	80	210	27	26	34	56	144	90	21	12	15
16	25	66	160	27	24	32	58	154	85	21	14	14
17	44	58	120	27	22	33	57	132	80	21	27	14
18	33	60	111	27	21	40	56	101	76	21	36	14
19	26	75	106	27	20	90	56	87	74	21	21	18
20	22	63	95	27	19	162	56	142	70	21	21	25
21	20	52	147	28	19	132	56	146	66	19	19	32
22	19	49	410	28	19	92	58	126	64	19	14	23
23	18	47	163	28	19	50	65	103	70	18	13	20
24	18	43	105	29	19	45	75	79	90	18	12	19
25	18	41	75	30	19	95	80	61	150	18	11	24
26	18	41	52	31	19	548	110	55	210	17	10	27
27	22	40	48	32	19	723	95	453	330	17	11	21
28	25	38	45	34	19	341	71	2,040	440	17	10	19
29	30	36	41	37	19	237	58	2,100	211	16	10	18
30	34	35	38	45	------	168	53	719	174	12	10	15
31	36	------	36	130	------	137	------	365	------	12	10	------
TOTAL	657	2,202	5,895	999	3,909	3,572	2,846	7,530	4,072	916	481	562
MEAN	21.2	73.4	190	32.2	135	115	94.9	243	136	29.5	15.5	18.7
MAX	44	166	1,380	130	1,000	723	379	2,100	440	118	36	37
MIN	12	35	32	24	19	20	50	33	64	12	10	11
CFSM	.154	.532	1.38	.233	.978	.833	.688	1.76	.986	.214	.112	.136
IN	.18	.59	1.59	.27	1.05	.96	.77	2.03	1.10	.25	.13	.15

CAL YR	1967	TOTAL	48,568.5	MEAN	133	MAX	1,880	MIN	8.5	CFSM	.964	IN	13.09
WTR YR	1968	TOTAL	33,641	MEAN	91.9	MAX	2,100	MIN	10	CFSM	.666	IN	9.07

PEAK DISCHARGE (BASE, 800 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-13	1130	11.86	1,540	03-27	0600	9.06	869
02-02	1900	13.95	1,300	05-28	2230	13.89	2,900

4-1540. Chippewa River near Mount Pleasant, Mich.

Location.--Lat 43°37'35", long 84°42'30", on line between secs. 7 and 8, T.14 N., R.3 W., on right bank 12 ft downstream from highway bridge and 4 miles northeast of Mount Pleasant.

Drainage area.--416 sq mi.

Records available.--October 1930 to September 1931, October 1932 to September 1968. Monthly discharge only for some periods, published in WSP 1307. Gage-height records for flood seasons collected in this vicinity 1910-27, are contained in reports of U. S. Weather Bureau.

Gage.--Digital water-stage recorder. Datum of gage is 710.38 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Oct. 21, 1938, chain and wire-weight gage at site 30 ft upstream at same datum. Oct. 21, 1938, to June 18, 1965, graphic water-stage recorder at same site and datum.

Average discharge.--37 years, 289 cfs.

Extremes.--Maximum discharge during year, 1,550 cfs May 29 (gage height, 7.35 ft); minimum, 79 cfs Aug. 5 (gage height, 2.86 ft); minimum daily, 82 cfs Aug. 5.
1930-31, 1932-68: Maximum discharge, 4,960 cfs Mar. 8, 1946 (gage height, 12.78 ft); minimum, 12 cfs Aug. 18, 1945; minimum daily, 19 cfs Aug. 16, 1936; minimum gage height, 2.70 ft Oct. 8, 1966.

Remarks.--Records good except those for the winter periods, which are fair. Diurnal fluctuation below 750 cfs caused by powerplant at Mount Pleasant prior to 1962; occasional regulation at low flow since. Since July 30, 1968, occasional regulation from control structures on lake outlets.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	234	359	268	270	712	200	457	285	849	451	97	92
2	228	520	260	280	1,290	200	436	275	734	398	88	96
3	215	570	261	280	1,200	200	417	264	645	356	83	99
4	208	628	258	290	1,050	205	466	259	580	259	83	97
5	201	563	257	290	800	210	520	258	485	279	82	103
6	194	498	292	280	700	225	481	255	422	309	86	99
7	189	436	351	280	642	240	437	256	377	265	101	98
8	196	391	467	270	529	281	410	249	345	223	103	100
9	215	364	455	270	462	543	380	245	296	241	102	112
10	223	342	419	270	350	551	369	240	294	267	102	126
11	224	370	456	260	330	470	344	237	302	198	102	133
12	219	420	844	270	330	412	312	232	275	206	103	128
13	215	431	1,150	270	310	347	294	233	253	205	99	123
14	216	427	889	270	300	327	303	260	240	209	91	130
15	217	434	684	270	270	317	342	368	202	196	85	143
16	253	397	557	270	260	313	329	355	203	205	83	141
17	281	366	507	280	250	342	312	344	206	215	110	128
18	277	373	464	290	240	373	313	316	225	185	95	134
19	261	385	451	290	230	412	314	321	243	193	110	140
20	247	383	426	290	220	485	303	372	219	175	109	158
21	229	359	444	285	220	489	325	378	212	172	99	148
22	222	335	565	283	210	450	341	350	210	178	98	149
23	219	333	464	284	210	408	349	309	181	190	97	149
24	213	328	400	280	210	368	380	282	202	198	94	159
25	219	329	380	280	205	384	383	258	252	164	92	172
26	217	310	360	270	205	530	371	261	310	154	95	169
27	228	295	350	270	200	637	346	721	563	138	92	168
28	239	298	330	266	200	566	322	1,330	602	138	92	165
29	244	281	320	350	200	541	306	1,490	533	138	91	168
30	255	278	310	728	------	509	296	1,290	513	145	90	167
31	280	------	300	638	------	476	------	1,060	------	121	89	------
TOTAL	7,078	11,803	13,939	9,474	12,335	12,011	10,958	13,353	10,973	6,771	2,943	3,994
MEAN	228	393	450	306	425	387	365	431	366	218	94.9	133
MAX	281	628	1,150	728	1,290	637	520	1,490	849	451	110	172
MIN	189	278	257	260	200	200	294	232	181	121	82	92
CFSM	.55	.95	1.08	.73	1.02	.93	.88	1.04	.88	.53	.23	.32
IN.	.63	1.06	1.25	.85	1.10	1.07	.98	1.19	.98	.61	.26	.36

CAL YR 1967 TOTAL 149,269 MEAN 409 MAX 1,960 MIN 142 CFSM .98 IN 13.34
WTR YR 1968 TOTAL 115,632 MEAN 316 MAX 1,490 MIN 82 CFSM .76 IN 10.34

PEAK DISCHARGE (BASE, 1,000 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-13	0900	6.21	1,190	05-29	0400	7.35	1,550
02-02	1700	6.87	1,420				

4-1545. Chippewa River near Midland, Mich.

Location.--Lat 43°35'40", long 84°22'10", on line between sec.24, T.14 N., R.1 W., and sec.28, T.14 N., R.1 E., on upstream side of bridge on Meridian Road, 5 miles upstream from Pine River and 6 miles southwest of Midland.

Drainage area.--597 sq mi.

Records available.--October 1947 to September 1968. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Wire-weight gage read twice daily, and crest-stage gage. Datum of gage is 612.35 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources).

Average discharge.--21 years, 421 cfs.

Extremes.--Maximum discharge during year, 3,540 cfs May 29 (gage height, 5.56 ft); maximum gage height, 8.88 ft Feb. 2 (backwater from ice); minimum discharge, 89 cfs Aug. 31.

1947-68: Maximum discharge, 8,510 cfs Mar. 20, 1948 (gage height, 9.85 ft, from graph based on gage readings); maximum gage height observed, 12.43 ft Mar. 19, 1948 (ice jam); minimum daily discharge, 44 cfs Aug. 16, 1948.

Maximum stage known since at least 1904, 15.65 ft in March 1904, from information from Michigan State Highway Department (discharge, 16,000 cfs, from rating curve extended above 9,000 cfs by logarithmic plotting).

Remarks.--Records good except those for the winter periods, which are fair. Diurnal fluctuation below 750 cfs caused by powerplant at Mount Pleasant prior to 1962; occasional regulation at low flow since.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	250	390	360	350	1.600	250	763	357	1.450	727	134	100
2	250	586	360	350	2.500	250	655	340	1.200	586	110	114
3	240	695	350	350	3.200	250	610	318	1.040	490	96	114
4	220	749	350	360	2.500	250	664	308	907	390	96	118
5	200	722	324	360	1.900	250	871	302	754	302	103	114
6	192	642	348	360	1.400	250	781	296	628	414	100	130
7	180	554	448	340	1.100	270	682	286	562	482	126	110
8	172	469	659	300	950	300	602	286	506	384	162	103
9	205	434	749	290	840	600	522	280	408	296	154	114
10	225	396	650	290	740	1.000	490	265	420	340	150	174
11	225	420	704	290	640	950	466	265	402	286	146	198
12	240	530	1.240	300	580	800	426	250	402	222	142	194
13	235	594	1.980	300	520	600	396	250	362	250	146	178
14	230	562	1.780	300	480	480	374	255	335	250	138	174
15	225	530	1.250	310	420	420	438	396	313	235	114	190
16	265	498	938	320	380	390	458	458	280	226	114	194
17	312	483	794	330	360	420	426	432	275	218	162	174
18	324	448	650	340	330	450	420	396	270	218	190	166
19	295	448	602	350	310	500	426	374	308	202	186	178
20	275	476	570	340	290	580	420	432	308	214	190	198
21	260	462	570	330	280	590	438	466	286	194	162	210
22	250	427	767	320	270	560	466	426	286	198	146	198
23	250	414	677	310	260	500	458	402	260	202	142	190
24	250	414	562	310	260	482	602	368	260	202	130	178
25	240	420	554	310	260	506	628	335	296	202	118	210
26	245	408	450	310	250	862	554	330	379	194	103	210
27	250	390	430	310	250	1.370	490	1.040	709	178	106	202
28	285	372	390	320	250	1.190	444	2.840	1.160	166	100	194
29	300	370	360	350	250	988	396	3.340	1.030	158	106	190
30	324	370	350	540	------	853	379	2.520	844	166	103	186
31	360	------	350	1.200	------	763	------	1.920	------	198	96	------
TOTAL	7.774	14.673	20.566	11.140	23.370	17.924	15.745	20.533	16.640	8.790	4.071	5.003
MEAN	251	489	663	359	806	578	525	662	555	284	131	167
MAX	360	749	1,980	1,200	3,200	1,370	871	3,340	1,450	727	190	210
MIN	172	370	324	290	250	250	374	250	260	158	96	100
CFSM	.420	.819	1.11	.601	1.35	.968	.879	1.11	.930	.476	.219	.280
IN	.48	.91	1.28	.69	1.46	1.12	.98	1.28	1.04	.55	.25	.31

CAL YR	1967	TOTAL	210,368	MEAN	576	MAX	3,340	MIN	140	CFSM	.965	IN	13.10
WTR YR	1968	TOTAL	166,229	MEAN	454	MAX	3,340	MIN	96	CFSM	.760	IN	10.36

4-1550. Pine River at Alma, Mich.

Location.--Lat 43°22'45", long 84°39'20", in SW 1/4 SE 1/4 sec.34, T.12 N., R.3 W., on right bank 270 ft downstream from Superior Street Bridge (US 27A) on grounds of Municipal Water Works at Alma and 0.6 mile downstream from dam.

Drainage area.--288 sq mi.

Records available.--October 1930 to September 1968. Gage-height records for flood seasons collected in this vicinity 1910-28 are contained in reports of U. S. Weather Bureau.

Gage.--Digital water-stage recorder. Datum of gage is 718.37 ft above mean sea level, datum of 1929. Prior to Dec. 10, 1930, tape gage at Superior Street Bridge at different datum. Dec. 10, 1930, to June 15, 1968, staff gage at site 70 ft downstream from bridge and June 16 to Oct. 25, 1938, wire-weight gage at Superior Street Bridge, at present datum. Oct. 26, 1938, to June 18, 1965, graphic water-stage recorder at same site and datum.

Average discharge.--38 years, 199 cfs.

Extremes.--Maximum discharge during year, 1,710 cfs Feb. 3 (gage height, 7.22 ft); minimum, 38 cfs Aug. 28.
1930-68: Maximum discharge, 4,400 cfs Mar. 19, 1948 (gage height, 10.81 ft); minimum daily, 0.4 cfs Sept. 6, 1964, caused by closing of dam during construction of waterworks.

Remarks.--Records good except those for the winter periods, which are fair. Occasional regulation caused by dam 0.6 mile above station and by variable backwater from powerplant at St. Louis 5 1/2 miles below station. Since July 1965, about 3 cfs diverted above station for municipal and industrial use; sewage effluent is returned below station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	157	268	168	145	899	115	410	225	893	520	81	52
2	157	304	178	150	1,580	121	366	202	739	439	79	66
3	147	337	180	155	1,160	125	346	187	600	360	82	66
4	122	379	172	155	920	127	364	182	515	278	85	65
5	115	405	173	155	840	130	353	171	449	221	82	71
6	96	404	190	155	705	144	368	165	385	198	81	66
7	94	375	227	150	600	148	390	135	324	196	105	65
8	103	340	294	150	502	149	389	152	280	192	111	73
9	99	296	326	145	400	185	331	151	243	172	111	75
10	96	262	355	145	300	227	294	144	211	153	96	103
11	125	287	385	150	200	259	271	139	197	151	93	146
12	134	333	675	150	160	314	248	143	164	146	77	146
13	130	352	652	150	150	374	230	138	164	139	76	120
14	126	369	630	150	145	223	221	144	175	118	71	99
15	121	360	556	155	140	219	225	155	147	123	62	84
16	166	333	543	155	130	246	237	189	144	110	71	83
17	177	301	483	160	130	285	265	231	135	105	86	76
18	205	293	445	160	125	282	289	256	143	98	81	81
19	224	271	389	160	125	273	270	261	141	98	88	82
20	220	273	353	160	120	298	258	242	146	97	79	103
21	189	232	379	160	115	302	264	252	154	95	80	112
22	175	274	417	160	110	321	256	276	151	92	95	119
23	148	252	378	155	110	303	274	288	155	77	89	105
24	138	238	357	150	105	273	291	265	146	70	86	114
25	147	228	345	150	105	253	283	220	198	91	74	111
26	146	223	305	150	100	358	299	229	282	89	57	115
27	178	212	203	150	98	423	302	432	485	86	55	120
28	178	199	171	176	105	448	291	799	529	94	52	108
29	206	150	150	251	110	482	263	1,090	561	101	47	98
30	223	160	145	532	------	478	242	1,300	576	94	53	97
31	239	------	145	456	------	449	------	1,130	------	79	52	------
TOTAL	4,781	8,760	10,369	5,545	10,289	8,334	8,890	9,893	9,432	4,882	2,437	2,821
MEAN	154	292	334	179	355	269	296	319	314	157	78.6	94.0
MAX	239	405	675	532	1,580	482	410	1,300	893	520	111	146
MIN	94	150	145	145	98	115	221	135	135	70	47	52
CFSM	.54	1.01	1.16	.62	1.23	.93	1.03	1.11	1.09	.55	.27	.33
IN.	.62	1.13	1.34	.72	1.33	1.08	1.15	1.28	1.22	.63	.31	.36

CAL YR 1967 TOTAL 115,700 MEAN 317 MAX 2,220 MIN 44 CFSM 1.10 IN 14.94
WTR YR 1968 TOTAL 86,433 MEAN 236 MAX 1,580 MIN 47 CFSM .82 IN 11.16

4-1555. Pine River near Midland, Mich.

Location.--Lat 43°33'50", long 84°22'10", on line between sec.36, T.14 N., R.1 W., and sec. 4, T.13 N., R.1 E., on left bank at downstream side of bridge on Meridian Road, 7 miles southwest of Midland and 8 miles upstream from mouth.

Drainage area.--390 sq mi, approximately.

Records available.--May 1934 to September 1938, February 1948 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 623.94 ft above mean sea level, datum of 1929. May 31, 1934, to Sept. 30, 1938, tape, staff, or wire-weight gage at same site at datum 5.55 ft lower. Feb. 3, 1948, to Dec. 13, 1951, wire-weight gage, water-stage recorder, or staff gage at or near present site and datum. Dec. 14, 1951, to Nov. 18, 1965, graphic water-stage recorder at present site and datum.

Average discharge.--24 years, 273 cfs.

Extremes.--Maximum discharge during year, 2,900 cfs Feb. 2 (gage height, 12.08 ft); minimum, 42 cfs May 8 (gage height, 2.43 ft).
1934-38; 1948-68: Maximum discharge, 6,360 cfs Mar. 20, 1948 (gage height, 10.00 ft, from graph based on gage readings);maximum gage height, 12.08 ft Feb. 2, 1968.

Remarks.--Records good except those for the winter periods, which are fair. Regulation at low and medium stages by powerplant at St. Louis. Some diversion above station for irrigation.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	110	258	190	190	1,500	180	568	210	1,180	674	110	71
2	187	358	210	190	2,000	180	531	223	982	566	96	66
3	127	328	220	190	2,500	180	445	188	786	425	109	64
4	183	467	207	190	2,000	180	486	183	620	376	82	89
5	128	399	192	190	1,400	180	553	195	523	279	98	72
6	131	436	179	190	1,150	190	425	174	458	349	107	89
7	99	458	261	190	880	195	484	213	385	230	111	78
8	119	345	332	190	700	210	489	108	286	224	110	75
9	114	343	372	190	600	240	448	169	281	219	118	63
10	164	332	400	190	520	280	402	187	245	209	141	130
11	96	315	504	190	460	320	308	205	212	173	105	130
12	133	441	1,210	190	410	380	332	166	226	161	99	163
13	151	464	1,390	190	380	470	268	176	203	152	102	167
14	138	442	971	190	350	420	347	214	127	161	83	150
15	170	437	811	190	310	380	295	205	244	154	91	117
16	115	415	790	190	280	360	274	203	151	129	97	93
17	203	428	757	190	260	363	299	219	169	137	102	101
18	194	279	562	200	240	383	319	249	164	124	152	93
19	209	358	559	200	230	428	363	305	164	128	108	97
20	217	306	434	200	220	329	332	294	163	114	110	111
21	228	288	477	200	205	450	336	245	168	111	112	134
22	154	312	616	200	200	327	329	301	173	115	66	122
23	210	327	550	200	190	425	294	299	159	116	85	130
24	167	273	420	200	190	402	360	307	149	124	79	127
25	131	270	320	205	185	373	368	333	163	113	79	139
26	148	249	270	210	185	542	273	244	392	74	85	128
27	181	239	240	210	185	753	317	592	615	122	91	128
28	203	220	210	230	180	658	276	1,520	832	102	62	132
29	174	190	200	300	180	638	297	1,530	719	101	85	138
30	212	170	190	560	------	647	237	1,520	729	106	64	98
31	225	------	190	1,100	------	608	------	1,490	------	123	61	------
TOTAL	5,021	10,147	14,234	7,445	18,090	11,671	11,055	12,467	11,668	6,191	3,000	3,295
MEAN	162	338	459	240	624	376	369	402	389	200	96.8	110
MAX	228	467	1,390	1,100	2,500	753	568	1,530	1,180	674	152	167
MIN	96	170	179	190	180	180	237	108	127	74	61	63
CFSM	.42	.87	1.18	.62	1.60	.97	.94	1.03	1.00	.51	.25	.28
IN.	.48	.97	1.36	.71	1.73	1.11	1.05	1.19	1.11	.59	.29	.31

CAL YR 1967 TOTAL 150,287 MEAN 412 MAX 3,510 MIN 57 CFSM 1.06 IN 14.33
WTR YR 1968 TOTAL 114,284 MEAN 312 MAX 2,500 MIN 61 CFSM .80 IN 10.90

PEAK DISCHARGE (BASE, 1,200 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-13	0100	5.38	1,640	05-28	1700	5.70	1,710
02-02	1900	12.08	2,900				

4-1560. Tittabawassee River at Midland, Mich.

Location.--Lat 43°35'43", long 84°14'08", in NW 1/4 NE 1/4 sec.28, T.14 N., R.2 E., on right bank 2,000 ft downstream from dam at DOW Chemical Co. powerplant at Midland, 0.7 mile upstream from Bullock Creek, and 1.4 miles downstream from Chippewa River.

Drainage area.--2,400 sq mi, approximately.

Records available.--March 1936 to September 1968. Gage-height records for flood seasons collected in this vicinity 1910-26, 1928, and since 1946 are contained in reports of U. S. Weather Bureau.

Gage.--Digital water-stage recorder. Datum of gage is 580.28 ft above mean sea level, datum of 1929. Graphic water-stage recorder at datum 10.00 ft higher prior to Sept. 30, 1955, and Oct. 1, 1955, to Apr. 18, 1964, at same site and datum.

Average discharge.--32 years 1,552 cfs (adjusted for diversion).

Extremes.--Maximum discharge during year, 15,800 cfs May 29 (gage height, 24.22 ft); minimum, 230 cfs Sept. 1 (gage height, 9.90 ft); minimum daily, 244 cfs Aug. 4.

1936-68: Maximum discharge, 34,000 cfs Mar. 21, 1948 (gage height, 19.50 ft, datum then in use); minimum, 39 cfs Oct. 12, 1942; minimum daily, 111 cfs Aug. 21, 1949; minimum gage height, -0.96 ft Aug. 19, 1954, datum then in use, caused by bridge construction above station.

Maximum stage known since at least 1907, 19.7 ft (datum in use prior to 1956) Mar. 28, 1916, from information by U. S. Weather Bureau (discharge 34,800 cfs).

Remarks.--Records good. Water is diverted from river a short distance above station for industrial use. Small part returned to river at gage; small part returned to river a quarter of a mile below station; remainder returned 1 mile below. Extremes and dsily discharge not adjusted for diversion. Discharge below 4,000 cfs regulated by dam 2,000 ft above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	472	1,380	900	588	4,870	688	2,640	1,160	5,850	2,890	425	250
2	710	2,120	684	639	10,600	508	2,520	1,540	4,860	2,480	455	316
3	730	2,480	568	831	11,400	395	2,120	1,230	3,410	1,690	284	437
4	800	2,560	820	874	8,190	486	2,420	800	2,900	1,110	244	394
5	755	1,780	1,090	896	5,470	1,000	3,440	649	2,500	1,260	435	400
6	625	1,640	1,360	723	5,510	1,100	3,520	848	2,250	985	518	357
7	425	1,650	1,930	562	4,780	1,170	3,120	1,470	1,700	801	457	284
8	340	1,560	2,520	695	3,200	888	1,470	1,090	1,070	1,100	535	260
9	447	1,390	2,640	837	2,670	1,280	1,240	846	841	1,080	575	339
10	859	1,570	1,720	854	2,970	2,010	1,060	899	1,400	1,330	359	881
11	822	1,170	2,170	857	3,130	2,340	1,230	607	1,470	1,550	283	1,940
12	852	1,120	5,290	852	1,790	2,750	1,920	503	1,380	1,040	482	1,180
13	1,160	1,740	9,420	671	890	1,750	1,240	922	1,200	589	512	772
14	658	2,070	7,850	526	949	1,950	818	1,070	850	419	438	435
15	412	2,300	5,310	675	856	2,070	1,520	1,390	701	566	355	342
16	1,020	2,220	3,960	875	1,090	2,920	1,970	1,900	505	537	349	403
17	940	2,130	3,580	888	784	3,150	1,940	1,920	897	771	331	403
18	825	1,240	2,650	993	501	2,590	1,880	1,160	724	568	376	384
19	921	897	2,580	1,400	572	2,500	2,010	838	841	665	444	383
20	1,140	1,310	2,390	1,010	752	2,220	1,320	1,600	885	438	473	646
21	631	1,330	2,570	573	748	2,360	943	2,040	855	363	568	457
22	472	1,530	3,290	781	505	2,680	1,700	2,010	549	586	535	399
23	734	1,120	3,990	1,080	565	3,150	2,050	1,670	479	647	383	616
24	785	1,430	1,700	831	544	1,360	2,520	1,600	886	655	300	669
25	693	1,080	1,140	734	425	1,870	2,600	851	1,260	682	254	789
26	740	685	1,030	778	718	3,430	3,080	671	2,080	586	323	853
27	901	911	1,370	675	996	5,880	2,850	2,470	4,640	326	370	815
28	519	1,100	1,180	559	877	5,080	1,330	9,840	5,510	260	347	450
29	543	842	1,020	1,370	640	4,210	1,600	15,100	5,190	330	336	384
30	726	999	803	3,420	------	3,750	1,420	12,300	3,950	390	362	454
31	1,280	------	657	3,640	------	3,440	------	8,190	------	523	270	------
TOTAL	22,937	45,354	78,182	30,687	76,992	70,975	59,491	79,184	61,633	27,217	12,378	16,692
MEAN	740	1,512	2,522	990	2,655	2,290	1,983	2,554	2,054	878	399	556
MAX	1,280	2,560	9,420	3,640	11,400	5,880	3,520	15,100	5,850	2,890	575	1,940
MIN	340	685	568	526	425	395	818	503	479	260	244	250
†	75.7	73.4	72.7	70.7	76.0	75.9	78.0	76.6	85.3	89.4	93.4	86.9
MEAN‡	816	1,585	2,595	1,061	2,731	2,366	2,061	2,631	2,139	967	492	643
CFSM‡	.34	.66	1.08	.44	1.14	.99	.86	1.10	.89	.40	.20	.27
IN‡	.39	.74	1.25	.51	1.23	1.14	.96	1.26	.99	.46	.24	.30

CAL YR 1967 TOTAL 797,400 MEAN 2,185 MAX 15,800 MIN 261 MEAN‡ 2,265 CFSM‡ .94 IN‡ 12.81
WTR YR 1968 TOTAL 581,722 MEAN 1,589 MAX 15,100 MIN 244 MEAN‡ 1,669 CFSM‡ .70 IN‡ 9.46

PEAK DISCHARGE (BASE, 7,000 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-13	1230	20.34	9,760	05-29	1530	24.22	15,800
02-03	0230	22.42	12,100				

† Diversion in cubic feet per second, for industrial use; furnished by DOW Chemical Co.

‡ Adjusted for diversion made by DOW Chemical Co.

GPO 817-436-13

4-1570. Saginaw River at Saginaw, Mich.

Location.--Lat 43°26'00", long 83°56'30", in sec.24, T.12 N., R.4 E., on upstream side of Genesee Street Bridge in Saginaw, 3 3/4 miles downstream from Tittabawassee River and 18.1 miles upstream from mouth.

Drainage area.--6,060 sq mi, approximately.

Records available.--1904, 1908-9, 1912-13, 1916, 1918-19, 1929-30, and 1942 (flood discharge for certain periods only) in WSP 1084; December 1942 to September 1968 (high-water periods only); no highwater 1944, 1949, 1953, 1955, 1958, 1961, 1963, 1964, 1966. Gage-height records for flood seasons collected in this vicinity 1910-20, and for entire years since 1921 are contained in reports of U. S. Weather Bureau.

Gage.--Wire-weight gage read at least once daily. Datum of gage is 565.11 ft above mean sea level, International Great Lakes datum, levels by U. S. Weather Bureau. Auxiliary water-stage recorder on right bank at Essexville 15 miles downstream.

Extremes.--Maximum discharge during year, 26,800 cfs Feb. 4 (gage height, 17.23 ft).
1904-68: Maximum discharge, 68,000 cfs Mar. 29, 1904 (gage height, 24.9 ft).

Remarks.--Records good. Considerable diversion through metropolitan area of Saginaw.

Cooperation.--Gage readings at base gage furnished by U. S. Weather Bureau. Auxiliary gage-height record furnished by Corps of Engineers.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1									14.400			
2					17.800							
3					21.900							
4					26.200							
5					26.300							
6					24.300							
7					21.500							
8					19.600							
9					17.700							
10					18.400							
11					16.300							
12					13.600							
13												
14			15.000									
15			14.000									
16			12.000									
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27									12.000			
28						16.700						
29						16.400		13.100	12.400			
30					------	14.800		16.200				
31		------			------		------	16.400	------			-----

4-1585. Pigeon River near Owendale, Mich.

Location.--Lat 43°45'35", long 83°14'45", in SE 1/4 sec.36, T.16 N., R.10 E., on left bank 600 ft downstream from bridge on county road, 2 miles downstream from confluence of East and West Branches, and 2 1/2 miles northeast of Owendale.

Drainage area.--55 sq mi, approximately.

Records available.--October 1952 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 645 ft (from topographic map). Prior to June 10, 1954, wire-weight gage at site 600 ft upstream at same datum.

Average discharge.--16 years, 28.0 cfs.

Extremes.--Maximum discharge during year, 1,220 cfs Mar. 27 (gage height, 8.7 ft); maximum gage height, 9.86 ft Feb. 2 (backwater from ice); minimum discharge, 2.0 cfs Aug. 25.
1952-68: Maximum discharge, 2,550 cfs Mar. 25, 1954 (gage height, 10.75 ft), from rating curve extended above 1,200 cfs; minimum, 0.1 cfs July 31, Aug. 1, 1964.

Remarks.--Records fair.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.8	35	20	20	170	10	84	41	39	30	5.4	2.4
2	5.2	84	20	17	300	10	66	32	36	22	5.4	3.2
3	4.8	75	20	15	660	10	58	27	32	18	4.6	4.0
4	4.8	117	20	14	540	10	60	25	25	14	4.2	3.4
5	4.4	79	20	13	350	10	60	22	21	13	4.0	2.8
6	4.2	48	24	12	110	10	51	18	17	12	4.4	2.5
7	4.8	40	46	11	80	11	48	17	14	9.7	5.6	2.4
8	5.2	37	61	11	65	13	46	16	12	8.5	5.4	2.3
9	7.3	35	51	10	55	21	42	16	10	9.1	5.4	2.3
10	7.9	33	43	10	50	40	39	15	10	11	5.0	2.6
11	7.9	39	192	10	42	68	37	14	18	9.7	4.2	3.4
12	7.9	72	746	10	35	60	36	14	34	7.9	3.8	3.6
13	7.6	69	517	10	32	55	34	15	27	6.8	3.6	2.8
14	8.8	52	120	10	28	50	41	18	19	6.4	3.4	2.6
15	10	45	70	10	25	45	84	21	15	6.4	2.9	2.6
16	17	36	68	11	22	40	58	25	12	6.6	2.9	2.6
17	23	38	62	11	20	40	47	24	9.4	7.3	2.9	2.3
18	26	56	60	12	18	42	48	20	8.5	8.5	2.8	2.3
19	25	105	62	12	16	52	48	20	9.1	23	2.8	2.6
20	24	67	60	12	15	62	42	27	8.5	28	2.8	7.3
21	21	45	85	13	13	59	41	28	7.6	12	2.6	5.8
22	19	39	176	13	12	50	40	27	9.1	8.5	2.3	2.8
23	18	40	85	14	12	38	38	22	8.8	6.8	2.4	2.5
24	18	40	60	14	11	35	55	20	9.7	6.6	2.3	2.5
25	18	36	52	13	10	45	57	16	14	6.4	2.2	4.4
26	18	34	47	13	10	481	57	15	60	5.6	2.1	4.2
27	22	32	40	13	10	823	48	24	98	5.2	2.2	4.2
28	49	28	35	13	10	243	41	55	92	5.4	2.2	4.2
29	50	23	30	30	10	106	38	69	50	5.4	2.1	3.8
30	39	21	25	50	------	76	46	61	39	5.4	2.1	3.0
31	34	------	23	120	------	69	------	50	------	4.6	2.2	------
TOTAL	517.6	1500	2940	547	2731	2684	1490	814	764.7	329.8	106.2	97.4
MEAN	16.7	50.0	94.8	17.6	94.2	86.6	49.7	26.3	25.5	10.6	3.43	3.25
MAX	50	117	746	120	660	823	84	69	98	30	5.6	7.3
MIN	4.2	21	20	10	10	10	34	14	7.6	4.6	2.1	2.3
CFSM	.304	.909	1.72	.320	1.71	1.57	.904	.478	.464	.193	.062	.059
IN	.35	1.01	1.99	.37	1.85	1.81	1.01	.55	.52	.22	.07	.07

CAL YR	1967	TOTAL	19,945.3	MEAN	54.6	MAX	1,700	MIN	3.0	CFSM	.993	IN	13.49
WTR YR	1968	TOTAL	14,521.7	MEAN	39.7	MAX	823	MIN	2.1	CFSM	.722	IN	9.82

PEAK DISCHARGE (BASE, 500 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-12	1900	8.30	895	03-27	0200	8.7	1,220
02-03	unknown	unknown	900				

4-1595. Black River near Fargo, Mich.

Location.--Lat 43°05'32", long 82°37'05", in NW¼ sec. 32, T.8 N., R.16 E., on left bank 20 ft downstream from bridge on Norman Road, 2.1 miles east of Fargo, 5.3 miles upstream from Mill Creek, and 12 miles northwest of Port Huron.

Drainage area.--480 sq mi (revised).

Records available.--February 1944 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 613.75 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to July 9, 1954, wire-weight gage and July 9, 1954, to Oct. 11, 1965, graphic water-stage recorder at same site and datum.

Average discharge.--24 years, 277 cfs.

Extremes.--Maximum discharge during year, 11,500 cfs Feb. 2 (gage height, 15.09 ft); minimum, 13 cfs Aug. 23, 26, 27 (gage height, 1.74 ft).
1944-68: Maximum discharge, 14,400 cfs Apr. 5, 1947 (gage height, 16.06 ft, from floodmark), from rating curve extended above 9,500 cfs; maximum gage height observed, 18.05 ft Feb. 20, 1951 (ice jam); minimum discharge observed, 1.8 cfs Sept. 18, 19, 1946.

Remarks.--Records good except those for the winter periods, which are poor. Records of suspended sediment loads for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	54	120	129	160	4,100	115	626	94	500	356	32	19
2	48	300	118	140	10,100	110	483	90	357	254	32	20
3	43	700	125	130	8,620	110	363	88	302	177	34	19
4	37	1,700	127	120	6,880	110	405	87	240	133	34	19
5	36	1,100	125	115	5,380	110	576	88	182	122	29	22
6	32	700	150	110	3,810	110	453	84	144	237	29	23
7	28	390	250	105	2,290	110	310	79	118	194	37	21
8	34	305	500	100	1,100	115	252	76	101	131	89	22
9	116	248	700	95	700	120	212	78	89	188	245	22
10	152	218	550	90	550	125	172	81	80	319	159	22
11	118	222	1,400	90	430	130	150	90	94	146	76	22
12	77	396	3,000	90	370	135	133	97	103	96	55	22
13	57	600	2,500	90	320	140	123	97	123	73	42	22
14	50	572	2,220	85	270	160	114	102	106	62	34	24
15	50	489	816	85	240	200	129	125	85	54	30	24
16	185	393	429	85	220	577	210	275	71	50	36	22
17	453	308	330	85	200	1,300	175	242	63	46	32	20
18	980	372	292	85	180	1,210	142	198	57	43	27	19
19	632	1,100	330	80	170	1,000	131	163	54	48	30	19
20	420	945	332	80	160	892	127	180	54	45	54	19
21	300	489	720	80	150	905	119	229	55	48	28	19
22	200	335	3,590	80	150	693	116	295	55	47	16	24
23	130	322	2,960	80	140	468	118	272	55	41	15	36
24	90	335	1,200	80	130	230	123	190	58	38	15	24
25	65	295	502	80	125	210	157	138	96	35	17	30
26	65	262	335	85	120	845	157	104	723	34	14	24
27	75	240	300	100	120	4,860	140	235	1,540	34	17	23
28	150	200	250	200	120	4,690	118	2,680	1,360	34	19	21
29	150	140	220	300	115	3,170	101	2,490	742	30	18	22
30	140	150	200	600	------	1,350	92	1,650	451	30	18	20
31	130	------	170	2,500	------	680	------	887	------	31	19	------
TOTAL	5,097	13,946	24,870	6,205	47,260	24,980	6,527	11,584	8,058	3,176	1,332	665
MEAN	164	465	802	200	1,630	806	218	374	269	102	43.0	22.2
MAX	980	1,700	3,590	2,500	10,100	4,860	626	2,680	1,540	356	245	36
MIN	28	120	118	80	115	110	92	76	54	30	14	19
CFSM	.34	.97	1.67	.42	3.40	1.68	.45	.78	.56	.21	.09	.05
IN.	.39	1.08	1.93	.48	3.66	1.94	.51	.90	.62	.25	.10	.05

CAL YR 1967 TOTAL 184,545 MEAN 506 MAX 7,360 MIN 24 CFSM 1.05 IN 14.30
WTR YR 1968 TOTAL 153,700 MEAN 420 MAX 10,100 MIN 14 CFSM .87 IN 11.91

PEAK DISCHARGE (BASE, 3,500 cfs)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-12	unknown	unknown	about 3,600	02-02	1800	15.09	11,500
12-22	1400	9.92	3,980	03-27	1100	11.51	5,310

4-1599. Mill Creek near Avoca, Mich.

Location.--Lat 43°03'16", long 82°44'05", in NW¼ sec.8, T.7 N., R.15 E., on left bank at downstream side of bridge on Bricker Road, 0.2 miles upstream from Gleason Drain, and 2.3 miles west of Avoca.

Drainage area.--169 sq mi (revised).

Records available.--April 1963 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 711.31 ft above mean sea level, datum of 1929.

Average discharge.--5 years, 78.7 cfs.

Extremes.--Maximum discharge during year, 3,540 cfs Feb. 2; maximum gage height, 8.36 ft Feb. 2 (ice jam); minimum discharge, 5.3 cfs Aug. 31 (gage height, 0.73 ft).
1963-68: Maximum discharge, 3,540 cfs Feb. 2, 1968; maximum gage height, 8.36 ft Feb. 2, 1968 (ice jam); minimum discharge, 0.8 cfs Aug. 9, 10, 11, 1964; minimum gage height, 0.56 ft July 28, 1965.

Remarks.--Records good except those for the winter period, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	11	35	43	60	1,000	20	266	42	202	160	12	5.9
2	10	150	39	54	3,200	20	204	38	153	135	9.8	6.8
3	9.8	199	43	48	2,140	19	165	35	120	109	8.6	7.1
4	9.0	348	45	43	1,300	17	207	40	95	90	9.4	8.6
5	11	276	52	37	800	20	270	40	76	82	9.0	9.8
6	9.0	179	59	32	540	24	209	38	61	126	9.4	10
7	8.1	126	121	28	400	26	156	35	49	73	14	9.8
8	12	97	216	24	350	29	130	33	39	50	28	9.4
9	20	79	223	21	270	31	108	34	31	42	101	8.1
10	20	69	180	20	200	35	86	36	26	39	65	8.6
11	18	72	522	20	140	38	75	39	25	29	34	17
12	16	110	845	20	110	41	66	39	24	25	23	51
13	14	158	740	20	96	45	60	42	22	22	19	40
14	15	153	475	20	86	50	56	52	20	20	16	25
15	27	135	292	20	70	70	86	39	20	18	14	16
16	28	107	186	21	52	200	86	51	18	17	12	13
17	48	94	182	22	43	400	72	49	18	16	11	12
18	95	124	144	23	35	380	61	44	18	14	9.8	10
19	76	176	131	24	30	376	56	50	17	18	12	9.8
20	73	137	120	26	25	342	52	50	16	16	13	9.8
21	48	103	329	28	22	330	50	58	15	14	12	10
22	36	86	908	30	21	292	54	61	18	12	12	13
23	29	85	707	31	20	199	51	56	18	12	9.8	12
24	24	85	408	31	20	98	66	50	20	13	9.0	13
25	20	78	250	29	19	185	102	41	31	11	7.1	13
26	20	71	160	27	19	552	90	35	138	9.4	6.5	11
27	22	65	130	27	19	1,370	74	88	252	10	6.8	11
28	47	46	100	28	19	1,070	61	472	241	11	7.4	10
29	48	50	88	40	20	744	52	510	194	9.4	6.5	9.4
30	42	50	80	100	------	495	45	418	173	9.8	5.9	8.6
31	37	------	70	500	------	334	------	302	------	12	5.6	------
TOTAL	902.9	3,543	7,888	1,454	11,066	7,852	3,116	2,917	2,150	1,224.6	518.6	398.7
MEAN	29.1	118	254	46.9	382	253	104	94.1	71.7	39.5	16.7	13.3
MAX	95	348	908	500	3,200	1,370	270	510	252	160	101	51
MIN	8.1	35	39	20	19	17	45	33	15	9.4	5.6	5.9
CFSM	.17	.70	1.51	.28	2.26	1.50	.61	.56	.42	.23	.10	.08
IN.	.20	.78	1.74	.32	2.44	1.73	.69	.64	.47	.27	.11	.09

CAL YR 1967: TOTAL 54,733.0 MEAN 150 MAX 2,260 MIN 2.8 CFSM .89 IN 12.04
WAT YR 1968: TOTAL 43,030.8 MEAN 118 MAX 3,200 MIN 5.6 CFSM .70 IN 9.47

PEAK DISCHARGE (BASE, 900 CFS)

DATE	TIME	G.HT	DISCHARGE	DATE	TIME	G.HT	DISCHARGE
12-22	1530	5.53	972	3-27	1230	6.44	1,490
02-20	1130	8.11	3,540				

4-1605.7. North Branch Belle River at Imlay City, Mich.

Location.--Lat 43°01'49", long 83°04'02", in SW1/4 NW1/4 sec.16, T.7 N., R.12 E., on left bank, 12 ft upstream from bridge on State Highway 21, and 0.6 miles northeast of Imlay City.

Drainage area.--18.0 sq mi.

Records available.--August 1965 to September 1968.

Gage.--Water-stage recorder and concrete control. Altitude of gage is 800 ft (from topographic map).

Extremes.--Maximum discharge during year, 212 cfs Feb. 2 (gage height, 8.12 ft); minimum, 0.27 cfs July 23; minimum gage height, 3.16 ft Aug. 29, 30, 31, Sept. 1.
1965-68: Maximum discharge, 212 cfs Feb. 2, 1968; minimum, 0.06 cfs July 25, 26, 27, 1966, Aug. 15, 1967; minimum gage height, 2.96 ft July 25, 26, 27, 1966.

Remarks.--Records fair except those for the winter period and those below 2.0 cfs, which are poor. Some diversion by pumping for sprinkler irrigation.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	3.8	7.4	5.5	4.0	141	2.7	22	9.0	14	20	1.2	.61
2	3.2	27	4.8	3.8	204	2.7	19	8.1	12	13	.96	1.2
3	2.6	30	5.2	3.7	164	2.7	18	7.8	9.4	7.8	.81	1.2
4	2.3	46	6.3	3.5	110	2.8	30	7.8	7.4	5.5	.81	1.2
5	2.0	30	6.3	3.4	74	3.0	27	7.0	5.5	6.3	.88	2.0
6	2.0	18	7.0	3.3	55	3.1	20	6.3	4.5	4.2	1.5	2.6
7	2.0	12	10	3.3	44	3.4	18	5.9	4.0	3.5	9.0	1.6
8	2.6	8.5	14	3.2	32	3.7	16	5.2	3.8	3.2	4.0	1.2
9	5.9	7.4	12	3.2	21	4.0	15	5.2	3.0	3.0	3.0	1.2
10	5.5	7.0	11	3.2	14	4.5	13	5.2	3.2	8.5	3.0	54
11	4.5	8.5	30	3.2	11	5.0	13	4.5	3.5	5.9	2.5	31
12	3.8	12	40	3.3	11	5.5	12	4.8	4.2	4.0	2.1	14
13	3.2	12	27	3.5	10	6.0	11	5.5	4.0	3.0	2.0	7.4
14	3.2	11	18	3.5	9.0	7.0	12	5.9	3.2	2.6	1.6	4.5
15	4.0	11	12	3.5	8.0	11	16	7.0	2.6	2.6	1.4	3.5
16	11	8.5	10	3.6	7.0	40	13	8.1	7.8	2.0	1.4	2.5
17	20	7.0	9.0	3.8	6.0	38	12	7.8	4.0	1.8	1.4	2.3
18	28	10	9.4	4.0	5.0	31	12	5.9	2.8	1.4	1.5	2.0
19	17	11	9.8	4.3	4.5	29	12	9.4	2.8	1.5	2.0	2.5
20	12	9.4	9.4	4.6	4.0	31	11	11	6.3	1.2	1.6	2.6
21	7.8	7.8	50	5.0	3.5	30	14	10	3.5	1.0	1.4	2.6
22	5.9	7.0	86	5.0	3.2	24	13	11	3.5	.74	1.4	2.6
23	5.2	8.1	42	5.0	3.0	37	14	8.5	3.0	.35	1.2	2.8
24	4.8	7.8	26	5.0	2.9	27	20	6.6	3.0	1.2	1.0	3.8
25	4.5	7.4	18	4.7	2.7	22	16	5.2	10	1.2	.96	6.3
26	4.2	7.0	13	4.7	2.7	84	14	5.2	46	1.0	.81	4.2
27	5.9	6.6	10	5.0	2.7	86	13	22	36	.96	.74	4.0
28	12	7.0	6.0	7.0	2.7	56	11	56	27	1.2	.61	3.5
29	8.5	4.5	5.0	13	2.7	42	9.8	41	23	.74	.61	3.0
30	7.4	4.2	4.4	25	------	30	11	29	30	.55	.61	2.8
31	6.6	------	4.2	50	------	24	------	19	------	.81	.55	------
TOTAL	211.4	361.1	521.3	201.3	960.6	698.1	457.8	350.9	293.0	110.75	52.55	174.71
MEAN	6.82	12.0	16.8	6.49	33.1	22.5	15.3	11.3	9.77	3.57	1.70	5.82
MAX	28	46	86	50	204	86	30	56	46	20	9.0	54
MIN	2.0	4.2	4.2	3.2	2.7	2.7	9.8	4.5	2.6	.35	.55	.61
CFSM	.38	.67	.93	.36	1.84	1.25	.85	.63	.54	.20	.09	.32
IN.	.44	.75	1.08	.42	1.98	1.44	.95	.72	.61	.23	.11	.36

CAL YR 1967: TOTAL 4,856.81 MEAN 13.3 MAX 123 MIN .09 CFSM .74 IN 10.03
WAT YR 1968: TOTAL 4,393.51 MEAN 12.0 MAX 204 MIN .35 CFSM .67 IN 9.08

PEAK DISCHARGE (BASE, 60 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-22	0130	5.45	104	03-26	1930	6.18	136
02-02	1000	8.12	212	05-28	1100	4.56	62
03-16	1900	4.53	62	09-10	0130	4.64	64

4-1606. Belle River at Memphis, Mich.

Location.--Lat 42°54'03", long 82°46'09", in NW¼ SE¼ sec. 35, T.6 N., R.14 E., on right bank, at downstream side of bridge on State Highway 19 at Memphis.

Drainage area.--151 sq mi (revised).

Records available.--October 1962 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 720 ft (from topographic map).

Average discharge.--6 years, 63.5 cfs.

Extremes.--Maximum discharge during year, 4,070 cfs Feb. 2; maximum gage height, 8.88 ft Feb. 1 (ice jam); minimum discharge, 9.8 cfs Aug. 29, 30, 31, Sept. 1 (gage height, 1.30 ft).

1962-68: Maximum discharge, 4,070 cfs Feb. 2, 1968, maximum gage height, 8.88 ft Feb. 1, 1968 (ice jam); minimum discharge, 3.1 cfs Mar. 10, 1964 (gage height, 1.19 ft).

Flood of April 1947 reached a stage of about 9 ft, from information by local residents.

Remarks.--Records good except those for the winter period, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	14	23	24	43	1,000	18	180	44	170	251	16	10
2	13	114	28	36	2,450	18	148	46	122	164	16	12
3	12	158	31	33	1,900	17	122	43	95	107	16	13
4	12	264	35	31	1,100	16	194	39	70	73	16	14
5	12	206	36	28	600	18	255	39	55	56	15	14
6	12	122	40	26	350	20	182	39	43	45	15	14
7	12	78	71	24	240	21	134	36	34	38	19	15
8	14	56	142	22	190	24	110	32	28	33	26	14
9	21	45	154	21	150	26	89	29	25	31	34	13
10	28	38	124	20	120	28	73	31	22	38	28	13
11	32	48	377	20	90	32	63	31	22	66	23	48
12	24	96	585	20	74	35	59	30	22	45	18	60
13	18	104	512	21	66	40	53	30	21	33	16	39
14	15	82	278	21	60	45	48	31	20	26	15	28
15	16	74	160	21	50	58	70	26	19	23	14	22
16	25	55	95	22	45	80	126	32	18	22	14	18
17	45	51	106	23	38	370	86	30	18	20	13	16
18	80	51	84	24	32	360	67	32	22	18	13	16
19	70	66	96	26	27	290	59	31	21	18	20	16
20	43	59	102	28	23	282	55	36	20	19	16	16
21	29	48	344	30	21	284	51	48	18	20	18	15
22	20	40	1,050	31	19	255	53	50	22	17	16	15
23	18	43	729	31	18	176	59	50	19	16	14	15
24	16	44	395	30	18	113	59	38	18	16	13	16
25	15	43	244	28	17	128	84	30	49	15	12	18
26	14	39	144	28	17	508	86	24	482	16	12	18
27	16	35	110	31	17	1,170	70	76	495	16	11	18
28	20	26	90	40	17	843	58	382	336	16	11	16
29	32	26	70	80	17	485	48	510	218	15	9.8	14
30	30	31	60	250	------	294	44	402	239	15	9.8	13
31	25	------	50	500	------	212	------	255	------	14	10	------
TOTAL	753	2,165	6,366	1,589	8,766	6,266	2,785	2,552	2,763	1,302	499.6	569
MEAN	24.3	72.2	205	51.3	302	202	92.8	82.3	92.1	42.0	16.1	19.0
MAX	80	264	1,050	500	2,450	1,170	255	510	495	251	34	60
MIN	12	23	24	20	17	16	44	24	18	14	9.8	10
CFSM	.16	.48	1.36	.34	2.00	1.34	.61	.55	.61	.28	.11	.13
IN.	.19	.53	1.57	.39	2.16	1.54	.69	.63	.68	.32	.12	.14

CAL YR 1967: TOTAL 48,214.0 MEAN 132 MAX 1,610 MIN 8.5 CFSM .87 IN 11.87
WAT YR 1968: TOTAL 36,375.6 MEAN 99.4 MAX 2,450 MIN 9.8 CFSM .66 IN 8.96

PEAK DISCHARGE (BASE, 600 cfs)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-12	0600	4.79	608	02-02	0700	8.49	4,070
12-22	1430	6.54	1,150	03-27	0600	6.94	1,340

4-1608. Sashabaw Creek near Drayton Plains, Mich.

Location.--Lat 42°43'12", long 83°21'13", in SE1/4 sec.26, T.4 N., R.9 E., on right bank 25 ft upstream from bridge on Maybee Road, 1.1 miles upstream from mouth, and 2.5 miles northeast of Drayton Plains.

Drainage area.--21.0 sq mi.

Records available.--October 1959 to September 1968.

Gage.--Digital water-stage recorder. Metal V-notch weir Aug. 30, 1961 to Mar. 6, 1968. Altitude of gage is 970 ft (from topographic map). Prior to May 16, 1968, graphic water-stage recorder at same site and datum.

Average discharge.--9 years, 9.39 cfs.

Extremes.--Maximum discharge during year, 138 cfs June 26 (gage height, 4.22 ft); maximum gage height, 4.23 ft Feb. 2; minimum discharge, 1.7 cfs Oct. 7, 8; minimum gage height, 1.85 ft July 29.
1959-68: Maximum discharge, 138 cfs June 26, 1968 (gage height, 4.22 ft); maximum gage height, 4.23 ft Feb. 2, 1968; minimum discharge, 0.2 cfs on many days during 1961, 1963, 1964, 1965, 1966; minimum gage height, 1.59 ft Aug. 1, 2, 1960.

Remarks.--Records good except those for the winter period, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.3	11	7.8	16	52	7.0	31	15	23	33	7.8	5.5
2	2.8	20	7.5	15	96	7.5	28	14	20	28	6.9	6.2
3	2.5	18	7.6	14	74	8.0	26	14	18	24	6.2	6.1
4	2.2	21	9.0	13	64	8.0	36	14	17	21	5.8	6.0
5	2.2	19	11	12	56	8.5	37	13	15	19	5.8	6.3
6	2.0	17	13	11	49	9.0	33	13	14	18	6.1	6.3
7	1.7	16	15	11	45	9.5	31	12	13	17	6.5	6.0
8	2.3	14	17	10	40	10	28	11	12	15	6.3	5.7
9	4.0	13	15	10	35	14	26	11	11	15	6.5	5.7
10	3.5	12	19	10	30	16	24	11	10	17	6.2	7.1
11	3.0	14	26	9.5	25	15	23	9.9	10	17	5.7	7.8
12	2.6	17	29	9.0	20	14	22	9.5	11	14	5.4	7.1
13	2.5	15	24	9.0	18	13	21	9.7	9.8	13	5.1	6.6
14	2.6	14	21	9.0	16	13	22	11	8.8	12	4.9	6.2
15	3.7	14	18	9.0	15	13	35	12	8.7	11	4.7	5.9
16	12	12	16	9.0	14	20	29	13	8.4	9.8	5.4	5.6
17	12	12	15	9.0	13	23	26	13	8.4	10	11	5.4
18	14	15	16	9.0	12	24	25	12	7.9	8.8	7.7	5.4
19	10	15	18	9.5	11	24	24	14	7.7	9.0	26	5.6
20	8.5	13	16	10	10	26	22	14	7.2	7.9	21	5.7
21	7.7	12	43	10	9.6	27	22	13	7.1	7.3	14	5.8
22	7.1	13	82	10	9.0	25	21	12	7.5	6.7	12	6.0
23	7.1	13	58	10	9.0	25	20	11	7.2	6.3	10	6.2
24	6.8	12	40	11	9.0	29	20	10	7.5	7.1	8.7	7.4
25	7.1	12	36	12	9.0	24	20	9.4	24	7.0	7.9	9.2
26	7.1	11	31	11	8.5	36	19	11	114	6.3	7.3	7.8
27	9.1	11	29	12	8.0	49	18	33	78	7.4	6.8	7.4
28	13	11	26	13	7.0	44	17	45	59	8.9	6.4	7.1
29	11	10	22	18	7.0	41	16	38	44	5.8	6.0	6.9
30	10	8.3	19	31	------	37	16	32	39	6.1	5.8	6.6
31	9.8	------	17	27	------	34	------	27	------	6.3	5.6	------
TOTAL	193.2	415.3	723.9	379.0	771.1	653.5	738	487.5	628.2	394.7	251.5	192.6
MEAN	6.23	13.8	23.4	12.2	26.6	21.1	24.6	15.7	20.9	12.7	8.11	6.42
MAX	14	21	82	31	96	49	37	45	114	33	26	9.2
MIN	1.7	8.3	7.5	9.0	7.0	7.0	16	9.4	7.1	5.8	4.7	5.4
CFSM	.30	.66	1.11	.58	1.27	1.00	1.17	.75	1.00	.61	.39	.31
IN.	.34	.74	1.28	.67	1.37	1.16	1.31	.86	1.11	.70	.45	.34

CAL YR 1967 TOTAL 5,833.6 MEAN 16.0 MAX 82 MIN 1.0 CFSM .76 IN 10.33
WTR YR 1968 TOTAL 5,828.5 MEAN 15.9 MAX 114 MIN 1.7 CFSM .76 IN 10.32

PEAK DISCHARGE (BASE, 45 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-22	0600	3.96	81	05-27	2300	3.29	45
02-02	1200	4.23	99	06-26	0700	4.22	138
03-27	0200	3.52	54				

4-1609. Clinton River near Drayton Plains, Mich.

Location.--Lat 42°39'37", long 83°23'25", in NE1/4 sec.21, T.3 N., R.9 E., on left bank 14 ft downstream from bridge on State Highway 59, 1 mile downstream from State fish hatchery, and 2.0 miles south of Drayton Plains.

Drainage area.--79.5 sq mi.

Records available.--October 1959 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 940 ft (from topographic map). Jan. 29 to July 9, 1964, staff gage at same site and datum.

Average discharge.--9 years, 39.8 cfs.

Extremes.--Maximum discharge during year, 175 cfs June 30 (gage height, 4.65 ft); minimum, 16 cfs May 8; minimum gage height, 2.05 ft May 6, 8.
1959-68: Maximum discharge, 175 cfs June 30, 1968 (gage height, 4.65 ft); minimum, 2.4 cfs May 31, 1961; minimum gage height, 1.23 ft Jan. 4, 1961.

Remarks.--Records fair except those for the winter periods, which are poor. Some regulation and occasional diversion for lake level control at many lakes above station. Records of water temperatures for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	22	55	54	85	99	50	121	66	106	170	45	61
2	22	61	54	80	125	48	121	64	102	162	39	59
3	21	62	55	75	143	47	121	61	97	156	36	50
4	20	65	54	70	164	47	130	51	93	142	35	45
5	20	64	54	70	171	48	126	45	85	132	36	47
6	20	64	55	65	172	49	124	32	77	126	38	46
7	19	66	57	65	171	48	120	26	69	115	42	45
8	22	69	58	65	169	49	114	20	63	108	52	44
9	23	75	58	65	167	51	112	17	56	104	69	43
10	23	80	61	65	150	51	112	19	54	104	68	46
11	20	85	67	65	140	52	109	22	54	97	63	47
12	20	84	70	65	130	56	105	25	48	93	60	46
13	20	82	72	65	120	59	101	26	32	86	55	45
14	20	80	74	65	110	61	98	28	22	80	45	45
15	24	80	77	65	100	63	98	29	25	77	36	45
16	38	78	73	65	95	66	98	31	26	72	45	45
17	52	77	75	65	90	66	97	32	28	67	73	43
18	58	76	81	66	85	68	96	35	26	65	64	43
19	72	74	83	70	80	70	96	37	26	64	82	43
20	84	73	84	65	75	73	96	37	26	61	93	44
21	81	71	105	60	70	77	94	38	28	58	101	44
22	77	69	117	60	70	82	91	40	30	54	115	45
23	73	63	124	60	70	91	89	40	31	48	120	47
24	69	61	129	60	67	97	85	42	32	44	118	49
25	66	59	131	60	64	99	82	39	64	45	110	50
26	62	56	130	60	60	97	81	42	140	38	101	50
27	66	56	130	61	60	99	77	68	149	26	93	50
28	65	55	120	64	55	109	73	90	162	35	86	48
29	62	56	110	69	52	115	70	92	172	35	80	46
30	57	55	100	73	------	120	68	94	174	37	64	45
31	53	------	90	73	------	121	------	101	------	40	59	------
TOTAL	1,351	2,051	2,602	2,061	3,124	2,229	3,005	1,389	2,097	2,541	2,123	1,406
MEAN	43.6	68.4	83.9	66.5	108	71.9	100	44.8	69.9	82.0	68.5	46.9
MAX	84	85	131	85	172	121	130	101	174	170	120	61
MIN	19	55	54	60	52	47	68	17	22	26	35	43
CFSM	.55	.86	1.06	.84	1.36	.90	1.26	.56	.88	1.03	.86	.59
IN.	.63	.96	1.22	.96	1.46	1.04	1.41	.65	.98	1.19	.99	.66

CAL YR 1967: TOTAL 22,248.7 MEAN 61.0 MAX 148 MIN 9.7 CFSM .77 IN 10.41
WAT YR 1968: TOTAL 25,979 MEAN 71.0 MAX 174 MIN 17 CFSM .89 IN 12.15

4-1610. Clinton River at Auburn Heights, Mich.

Location.--Lat 42°38'00", long 83°13'28", in NW1/4 sec.36, T.3 N., R.10 E., on right bank 30 ft upstream from bridge on State Highway 59, at Auburn Heights, and 2.8 miles upstream from Galloway Creek.

Drainage area.--123 sq mi.

Records available.--May 1935 to June 1939 and February to September 1940 (published as "at Pontiac"), October 1956 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 846.50 ft above mean sea level, datum of 1929. Prior to October 1940, staff gage at site 3.3 miles upstream at datum 876.01 feet above mean sea level, and October 1956 to Oct. 12, 1965, graphic water-stage recorder at present site and datum.

Average discharge.--15 years (1935-38, 1956-68), 80.3 cfs.

Extremes.--Maximum discharge during year, 1,400 cfs June 25 (gage height, 4.88 ft); minimum, 37 cfs Oct. 15; minimum gage height, 1.21 ft Aug. 8, 11.
1935-40, 1956-68: Maximum discharge, 1,400 cfs June 25, 1968 (gage height, 4.88 ft); minimum observed, 4.8 cfs Sept. 4, 1936, site then in use.

Remarks.--Records good except those for the winter period, which are poor. Some regulation by many lakes above station. Flow includes waste from city of Pontiac water supply, most of which is obtained from sources outside the basin.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	47	154	68	150	382	100	162	148	156	298	156	134
2	47	198	118	140	452	100	168	162	148	296	124	144
3	53	159	155	130	295	94	205	163	150	285	92	134
4	53	165	147	124	246	94	319	160	155	204	71	139
5	53	142	145	120	230	94	248	154	179	227	72	181
6	50	139	145	115	241	94	223	142	184	297	60	147
7	46	117	153	113	249	94	210	115	185	281	71	131
8	50	98	146	110	249	94	211	97	143	276	61	118
9	79	91	132	110	247	99	206	83	96	401	70	113
10	54	92	137	110	238	100	202	85	88	465	54	125
11	52	118	191	110	220	102	199	94	118	302	48	103
12	49	111	198	110	200	108	189	85	150	269	54	93
13	50	108	158	110	180	111	178	62	134	253	64	90
14	51	139	148	110	170	117	200	66	133	238	93	83
15	56	150	143	110	160	121	210	59	111	235	105	73
16	119	144	134	110	160	159	190	77	78	233	117	75
17	139	145	128	110	150	126	183	57	77	224	269	60
18	110	152	146	110	140	125	181	50	74	193	142	55
19	71	136	148	127	140	126	175	67	74	179	265	64
20	69	131	144	103	130	129	164	55	71	159	185	87
21	70	133	397	92	130	135	153	57	70	146	169	95
22	67	138	339	102	130	155	150	57	93	146	169	94
23	78	132	232	109	130	161	164	57	68	146	158	106
24	115	128	176	106	120	169	159	57	88	187	162	124
25	141	128	187	105	110	194	118	52	312	150	158	119
26	172	125	205	105	110	236	108	92	659	138	148	103
27	211	126	215	101	110	217	108	310	446	150	147	99
28	170	89	214	158	110	196	104	248	358	139	146	122
29	147	64	200	201	110	186	110	194	335	126	142	131
30	143	63	180	209	------	176	121	177	308	122	142	135
31	147	------	160	144	------	168	------	162	------	137	136	------
TOTAL	2,759	3,815	5,389	3,764	5,539	4,180	5,318	3,444	5,241	6,912	3,850	3,277
MEAN	89.0	127	174	121	191	135	177	111	175	223	124	109
MAX	211	198	397	209	452	236	319	310	659	465	269	181
MIN	46	63	68	92	110	94	104	50	68	122	48	55
CFSM	.72	1.03	1.41	.99	1.55	1.10	1.44	.90	1.42	1.81	1.01	.89
IN.	.83	1.15	1.63	1.14	1.67	1.26	1.61	1.04	1.58	2.09	1.16	.99

CAL YR 1967 TOTAL 43,844 MEAN 120 MAX 397 MIN 37 CFSM .98 IN 13.26
WTR YR 1968 TOTAL 53,488 MEAN 146 MAX 659 MIN 46 CFSM 1.19 IN 16.17

PEAK DISCHARGE (BASE, 300 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-21	1100	3.42	620	05-27	1300	2.78	363
01-29	2400	2.63	297	06-25	2400	4.88	1,400
02-01	2000	3.44	615	07-09	2200	3.72	880
04-04	0500	2.92	418	08-17	0300	3.02	542
04-14	2100	2.70	335	08-19	1000	2.96	518

4-1611. Galloway Creek near Auburn Heights, Mich.

Location.--Lat 42°40'02", long 83°12'02", in SE1/4 sec.18, T.3 N., R.11 E., on right bank 12 ft downstream from wooden bridge on Michigan State University (Oakland Branch) property, and 2.7 miles northeast of Auburn Heights.

Drainage area.--17.8 sq mi.

Records available.--October 1959 to September 1968.

Gage.--Water-stage recorder. Concrete control since Aug. 20, 1960. Altitude of gage is 830 ft (from topographic map).

Average discharge.--9 years, 7.63 cfs.

Extremes.--Maximum discharge during year, 368 cfs June 25 (gage height, 6.27 ft); minimum, 0.63 cfs Oct. 6, 7, 8 (gage height, 1.45 ft).
1959-68: Maximum discharge, 368 cfs June 25, 1968 (gage height, 6.27 ft); minimum, 0.01 cfs on several days during July and August, 1964; minimum gage height, 0.82 ft Aug. 1, 1960.

Remarks.--Records fair except those for the winter period and those for period of no gage-height record, which are poor.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	1.1	7.2	5.7	6.0	180	3.3	24	6.9	36	42	12	5.5
2	.97	16	5.2	6.2	226	3.0	20	6.3	24	28	10	6.2
3	.87	15	8.2	5.6	162	2.9	19	6.0	17	20	8.7	5.1
4	.78	19	7.6	5.0	100	3.2	51	5.8	14	17	7.5	4.5
5	.70	16	8.2	4.5	70	3.5	47	6.0	11	15	7.1	8.9
6	.63	13	10	4.3	45	3.7	37	5.3	8.7	15	6.9	6.6
7	.63	11	13	4.0	37	4.3	28	4.9	7.1	13	10	5.2
8	2.1	9.4	15	3.9	31	5.0	22	4.7	5.8	11	9.9	4.5
9	3.0	8.6	14	3.9	24	6.0	18	5.8	4.8	20	13	4.1
10	1.3	7.6	16	4.0	17	7.0	16	5.1	4.3	38	13	5.2
11	1.5	11	41	4.0	12	7.9	15	4.9	4.6	20	12	6.0
12	1.5	12	51	4.0	9.0	8.5	13	5.4	5.7	16	10	5.5
13	1.5	11	43	3.9	7.0	9.0	12	4.7	4.8	12	9.1	5.1
14	1.7	11	32	3.9	6.4	9.4	15	5.1	4.1	11	8.0	4.6
15	2.7	9.4	21	4.1	6.0	11	21	5.3	4.5	9.0	7.1	4.1
16	9.0	8.0	17	4.5	5.0	37	19	7.5	4.0	8.1	7.4	3.7
17	17	8.1	15	5.0	4.5	32	16	6.5	3.9	7.3	23	3.2
18	18	9.9	18	5.4	4.3	27	15	6.1	3.5	7.1	16	2.9
19	12	9.5	19	5.6	4.0	23	14	8.6	3.4	8.4	46	3.5
20	8.7	8.7	17	5.6	3.7	26	13	9.6	3.1	6.4	43	3.2
21	6.6	8.2	175	5.6	3.6	27	12	9.0	2.7	5.5	29	2.8
22	5.3	9.4	140	5.6	3.5	24	11	8.7	3.6	4.9	20	2.9
23	4.3	9.6	95	5.6	3.5	18	11	7.5	3.0	4.5	16	3.9
24	3.6	9.1	60	5.4	3.4	17	12	6.3	3.7	7.7	13	4.0
25	3.9	8.6	45	5.4	3.3	23	11	5.1	60	6.5	11	4.2
26	3.0	8.1	31	5.4	3.3	58	10	11	262	5.2	9.3	3.5
27	7.0	7.3	22	6.0	3.3	79	9.5	116	184	6.3	8.1	3.0
28	7.0	6.5	17	10	3.3	60	8.4	152	108	7.6	7.0	2.6
29	5.6	6.1	13	30	3.3	48	7.8	100	72	6.6	6.1	2.3
30	5.3	6.0	10	60	------	38	8.1	64	56	5.8	5.4	2.1
31	5.1	------	7.5	90	------	31	------	48	------	8.0	5.0	------
TOTAL	142.38	300.3	995.4	322.4	984.4	665.7	535.8	648.1	929.3	392.9	409.6	128.9
MEAN	4.59	10.0	32.1	10.4	33.9	21.5	17.9	20.9	31.0	12.7	13.2	4.30
MAX	18	19	176	90	226	79	51	152	262	42	46	8.9
MIN	.63	6.0	5.7	3.9	3.3	2.9	7.8	4.7	2.7	4.5	5.0	2.1
CFSM	.26	.56	1.80	.58	1.91	1.21	1.00	1.17	1.74	.71	.74	.24
IN.	.30	.63	2.08	.67	2.06	1.39	1.12	1.35	1.94	.82	.86	.27

CAL YR 1967: TOTAL 4,992.08 MEAN 13.7 MAX 176 MIN .43 CFSM .77 IN 10.43
WAT YR 1968: TOTAL 6,455.18 MEAN 17.6 MAX 262 MIN .63 CFSM .99 IN 13.49

PEAK DISCHARGE (BASE, 90 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-21	unknown	unknown	unknown	03-26	1600	4.84	107
02-01	1900	5.83	266	05-27	2200	5.37	176
				06-25	2330	6.27	368

Note.--No gage-height record Feb. 10 to Mar. 11.

4-1615. Paint Creek near Lake Orion, Mich.

Location.--Lat 42°46'03", long 83°13'12", in NE¼ sec. 13, T.4 N., R.10 E., on left bank 100 ft upstream from railroad bridge, 1.6 miles southeast of Lake Orion, and 2.8 miles upstream from Trout Creek.

Drainage area.--38.9 sq mi.

Records available.--September 1955 to September 1968.

Gage.--Digital water-stage recorder. Altitude of gage is 940 ft (from topographic map). Prior to May 16, 1968, graphic water stage recorder at same site and datum.

Average discharge.--13 years, 21.0 cfs.

Extremes.--Maximum discharge during year, 359 cfs Feb. 4 (gage height, 3.50 ft); minimum, 3.8 cfs Dec. 1, 2, 4 (gage height 1.54 ft).

1955-68: Maximum discharge, that of Feb. 4, 1968; maximum gage height, 3.63 ft Apr. 20, 1967; minimum discharge, 1.2 cfs June 28, July 13, 14, 15, 1959.

Remarks.--Record good except those for the winter period, which are fair. Occasional regulation by Lake Orion.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	26	22	4.0	45	110	24	74	18	54	83	17	12
2	24	22	4.4	42	140	24	66	19	47	64	16	14
3	24	23	4.0	38	253	24	57	18	39	50	16	14
4	23	23	4.0	36	348	23	62	19	34	41	15	14
5	23	23	4.0	34	317	23	59	19	56	36	15	16
6	22	22	4.0	32	250	23	58	20	34	34	16	15
7	21	23	4.1	31	183	23	57	20	24	30	19	14
8	22	24	4.2	30	132	23	55	20	20	27	19	13
9	22	24	4.7	29	105	24	44	21	21	29	19	15
10	21	24	6.2	28	89	26	44	20	24	29	18	20
11	21	25	11	28	71	26	47	19	25	26	16	19
12	20	24	16	26	58	29	44	20	24	24	15	18
13	20	24	19	26	49	32	34	20	20	24	14	16
14	19	24	24	28	43	32	18	21	20	22	13	19
15	22	24	29	31	41	31	19	22	18	21	12	20
16	23	23	30	30	38	33	19	26	18	20	13	21
17	24	26	30	29	36	35	20	25	18	20	20	19
18	24	26	32	27	34	40	23	23	17	31	19	18
19	24	25	33	27	32	43	26	27	17	27	29	22
20	24	25	33	26	31	47	26	27	16	19	27	33
21	24	23	60	27	31	52	29	26	16	15	23	40
22	23	17	90	27	29	53	31	26	17	14	22	34
23	22	12	108	27	27	64	33	24	16	13	19	27
24	22	6.7	129	26	26	59	33	23	18	15	18	30
25	21	4.8	140	26	26	52	30	22	41	15	16	39
26	20	4.8	120	26	24	55	29	23	70	15	14	30
27	21	4.6	95	26	24	59	27	46	84	15	13	24
28	21	4.4	78	29	24	81	26	53	96	17	12	22
29	20	4.2	64	34	24	97	26	57	106	15	12	20
30	20	3.8	57	85	------	89	23	58	100	14	12	15
31	19	------	50	70	------	81	------	57	------	16	12	------
TOTAL	682	561.3	1,291.6	1,026	2,595	1,327	1,139	839	1,110	821	521	633
MEAN	22.0	18.7	41.7	33.1	89.5	42.8	38.0	27.1	37.0	26.5	16.8	21.1
MAX	26	26	140	85	348	97	74	58	106	83	29	40
MIN	19	3.8	4.0	26	24	23	18	18	16	13	12	12
CFSM	.57	.48	1.07	.85	2.30	1.10	.98	.70	.95	.68	.43	.54
IN.	.65	.54	1.23	.98	2.48	1.27	1.09	.80	1.06	.78	.50	.61

CAL YR 1967	TOTAL 12,446.7	MEAN 34.1	MAX 170	MIN 3.8	CFSM .88	IN 11.90
WTR YR 1968	TOTAL 12,545.9	MEAN 34.3	MAX 348	MIN 3.8	CFSM .88	IN 11.99

PEAK DISCHARGE (BASE, 90 cfs)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-24	2330	2.83	149	06-05	1400	2.67	116
02-04	1500	3.50	359	06-25	2100	2.71	123
03-29	0300	2.55	97	06-29	1700	2.67	116

4-1615.4. Paint Creek at Rochester, Mich.

Location.--Lat 42°41'18", long 83°08'35", in NW¼ SE¼ sec. 10, T.3 N., R.11 E., on right bank at upstream side of bridge on Ludlow Street in Rochester and 1.5 miles upstream from mouth.

Drainage area.--71.3 sq mi.

Records available.--October 1959 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 755.11 ft above mean sea level, datum of 1929. Prior to May 17, 1968, graphic water-stage recorder at same site and datum.

Average discharge.--9 years, 40.7 cfs.

Extremes.--Maximum discharge during year 918 cfs Feb. 1 (gage height, 5.22 ft); minimum, 21 cfs Nov. 29 (result of freeze up). 1959-68: Maximum discharge, 918 cfs Feb. 1, 1968; maximum gage height, 5.95 ft Feb. 10, 1965 (backwater from ice); minimum discharge, 3.9 cfs Aug. 3, 1967; minimum gage height, 1.26 ft Sept. 16, 1960.

Remarks.--Records good except those for the winter period, which are fair. Occasional regulation by Lake Orion.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	37	42	22	54	420	44	137	42	111	123	39	35
2	36	65	23	48	660	43	116	41	93	96	33	35
3	34	52	27	44	305	51	104	41	73	77	30	31
4	32	64	26	41	329	60	180	42	61	63	28	29
5	32	56	25	37	297	43	165	43	64	56	28	37
6	31	51	27	36	213	44	135	42	62	57	30	35
7	31	50	31	34	155	43	119	41	45	51	45	29
8	34	49	34	33	112	45	116	40	38	46	39	26
9	43	46	31	32	96	53	107	43	35	66	42	25
10	36	45	31	41	80	61	92	41	36	106	36	37
11	33	52	57	30	64	59	106	39	39	62	31	38
12	31	58	78	30	60	56	101	39	42	50	28	36
13	31	52	62	30	58	55	93	40	37	45	26	31
14	32	52	56	30	56	55	58	40	33	41	24	30
15	36	49	51	30	54	55	82	45	33	38	23	31
16	60	45	51	30	50	128	58	49	33	36	28	32
17	67	49	50	30	49	96	53	50	33	35	52	31
18	64	53	57	30	47	90	56	45	32	46	42	29
19	49	51	63	30	46	89	59	52	32	41	75	31
20	43	49	58	30	45	101	58	54	30	33	66	40
21	42	48	236	30	45	106	59	48	29	28	49	46
22	40	48	340	30	45	101	59	50	31	26	42	45
23	38	48	200	30	44	96	68	46	30	31	37	41
24	38	46	170	31	44	99	74	43	33	30	33	39
25	37	29	168	35	43	96	65	39	39	27	31	48
26	36	26	150	35	43	186	59	43	530	32	28	43
27	42	25	125	34	43	227	55	251	278	36	26	37
28	50	24	108	35	44	195	52	395	178	29	24	33
29	42	26	86	60	44	193	51	229	155	28	24	31
30	40	23	72	120	------	169	52	165	148	38	23	29
31	39	------	62	77	------	150	------	131	------	31	23	------
TOTAL	1,236	1,373	2,577	1,217	3,591	2,889	2,589	2,309	2,413	1,504	1,085	1,040
MEAN	39.9	45.8	83.1	39.3	124	93.2	86.3	74.5	80.4	48.5	35.0	34.7
MAX	67	65	340	120	660	227	180	395	530	123	75	48
MIN	31	23	22	30	43	43	51	39	29	26	23	25
CFSM	.56	.64	1.17	.55	1.74	1.31	1.21	1.04	1.13	.68	.49	.49
IN.	.64	.72	1.34	.63	1.87	1.51	1.35	1.20	1.26	.78	.57	.54

CAL YR 1967: TOTAL 22,490 MEAN 61.6 MAX 340 MIN 15 CFSM .86 IN 11.73
WAT YR 1968: TOTAL 23,823 MEAN 65.1 MAX 660 MIN 22 CFSM .91 IN 12.43

PEAK DISCHARGE (BASE, 200 cfs)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-21	2300	3.67	436	04-04	1100	3.10	206
02-01	2130	5.22	918	05-28	0100	4.05	478
03-26	2130	3.63	344	06-26	0600	4.83	762

4-1615.8. Stony Creek near Romeo, Mich.

Location.--Lat 42°48'03", long 83°05'25", in SW 1/4 sec.31, T.5 N., R.12 E., on right bank, at upstream side of bridge on Romeo Road, and 4.0 miles west of Romeo.

Drainage area.--25.6 sq mi.

Records available.--October 1964 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 861.64 ft above mean sea level, datum of 1929.

Extremes.--Maximum discharge during year, 229 cfs Feb. 1 (gage height, 4.53 ft); minimum, 2.2 cfs Mar. 4 (gage height, 1.41 ft).
1964-68: Maximum discharge, 229 cfs Feb. 1, 1968 (gage height, 4.53 ft); maximum gage height, 4.56 ft Feb. 10, 1965; minimum discharge, 0.92 cfs Oct. 5, 9, 1967; minimum gage height, 1.28 ft July 27, 28, 1965.

Remarks.--Records good except those for the winter periods, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	4.7	12	11	20	121	11	34	15	34	38	5.7	7.1
2	3.7	27	11	17	190	11	32	13	29	30	4.5	9.5
3	3.4	25	14	16	171	12	30	13	29	26	3.7	7.7
4	3.1	27	13	15	147	12	38	14	26	22	3.4	6.5
5	3.2	22	13	14	114	11	39	13	20	20	3.4	8.2
6	3.2	13	14	13	88	11	34	11	16	22	3.7	7.7
7	3.1	16	17	12	73	11	30	9.7	13	19	8.6	6.1
8	3.9	14	19	12	62	12	27	9.0	13	16	6.3	5.3
9	9.5	14	18	11	52	17	25	7.9	13	20	5.1	4.9
10	7.1	16	16	11	45	25	22	7.3	7.7	34	4.5	6.9
11	6.5	19	27	11	35	25	22	6.9	6.7	29	3.4	8.8
12	9.3	23	34	11	30	24	21	7.3	7.5	23	3.2	8.2
13	9.0	19	30	11	27	20	18	7.3	13	19	3.2	6.3
14	9.5	17	28	11	25	19	19	7.3	11	15	3.1	5.3
15	11	14	27	11	23	19	28	8.4	9.7	13	2.8	5.1
16	23	11	23	11	20	32	25	9.7	8.8	12	2.9	5.1
17	26	10	21	10	18	38	22	9.3	8.2	14	5.9	4.7
18	27	12	21	10	17	38	22	7.5	7.3	17	4.3	4.5
19	19	13	23	10	16	36	22	9.3	7.1	17	8.6	5.1
20	16	11	21	10	15	38	20	10	6.1	14	7.1	5.3
21	15	9.7	58	10	14	36	20	9.0	5.1	9.5	4.7	5.3
22	14	11	96	10	13	32	19	9.0	6.1	8.4	5.7	5.1
23	13	12	96	10	12	30	20	8.2	5.5	9.5	9.4	5.9
24	12	11	69	11	11	27	21	7.1	6.1	9.5	7.1	8.6
25	11	10	51	12	11	30	22	6.1	23	7.5	6.3	13
26	11	10	50	12	11	49	21	6.5	87	5.7	5.5	7.1
27	15	9.3	40	11	11	58	20	38	83	5.1	5.1	6.1
28	21	8.4	36	14	11	57	18	61	69	5.7	4.9	5.7
29	14	7.9	30	20	11	48	17	57	53	6.1	5.9	5.3
30	11	8.2	25	40	------	38	17	52	47	5.5	5.9	6.5
31	11	------	22	38	------	38	------	43	------	5.7	5.5	------
TOTAL	349.2	438.5	974	435	1,394	965	725	492.8	670.9	498.2	158.4	196.9
MEAN	11.3	14.6	31.4	14.0	48.1	27.9	24.2	15.9	22.4	16.1	5.11	6.56
MAX	27	27	96	40	190	58	39	61	87	38	8.6	13
MIN	3.1	7.9	11	10	11	11	17	6.1	5.1	5.1	2.8	4.5
CFSM	.44	.57	1.23	.55	1.88	1.09	.94	.62	.87	.63	.20	.26
IN.	.51	.64	1.41	.63	2.03	1.26	1.05	.72	.97	.72	.23	.29

CAL YR 1967: TOTAL 6,579.0 MEAN 18.0 MAX 98 MIN 2.0 CFSM .70 IN 9.56
WAT YR 1968: TOTAL 7,197.9 MEAN 19.7 MAX 190 MIN 2.8 CFSM .77 IN 10.46

PEAK DISCHARGE (BASE, 100 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-23	0900	3.34	105	02-01	1830	4.53	229

4-1617.90. Stony Lake near Washington, Mich.

Location.--Lat 42°42'58", long 83°05'58", in SE1/4 sec.31, T.4 N., R.12 E., on left bank 1,000 ft east of bridge over dam on Stony Creek, and 2.7 miles west of Washington.

Drainage area.--68.0 sq mi.

Records available.--February 1963 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 790.00 ft above mean sea level, datum of 1929 (levels by Huron-Clinton Metropolitan Authority). Gage readings have been converted to elevations above mean sea level.

Extremes.--Maximum contents during year, 5,349 acre-ft June 26 (elevation, 802.9 ft); minimum recorded, 1,758 acre-ft Nov. 21 (elevation 794.7 ft).
1963-68: Maximum contents, 5,349 acre-ft Apr. 19, 1967, June 26, 1968 (elevation, 802.9 ft); minimum recorded, that of Nov. 21, 1968.

Remarks.--Records good. Reservoir is formed by an earth-fill dam with concrete spillway completed in 1962. The spillway section includes a drum gate with minimum crest elevation of 796 ft, maximum of 802 ft, and 2 sluices, one on each side with valve controls (capable of draining lake). The reservoir began filling February 1963. Lake is used for recreational purposes.

Month-end elevation and contents, water year October 1967 to September 1968

Date	Elevation (feet)‡	Contents (Acre-feet)	Change in contents during month	
			(Acre-feet)	Equivalent in cfs
Sept. 30	796.1	2,236	-	-
Oct. 31	796.4	2,347	+111	+1.8
Nov. 30	795.2	1,921	-426	-7.2
Dec. 31	797.6	2,823	+902	+14.7
Calendar year 1967	-	-	-1,420	-2.0
Jan. 31	798.1	3,033	+210	+3.4
Feb. 29	797.7	2,864	-169	-2.9
Mar. 31	798.6	3,251	+387	+6.3
Apr. 30	801.2	4,490	+1,239	+20.8
May 31	802.6	5,196	+706	+11.5
June 30	802.6	5,196	0	0
July 31	802.1*	4,941	-255	-4.1
Aug. 31	801.9*	4,840	-101	-1.6
Sept. 30	800.5*	4,145	-695	-11.7
Water year 1967-68	-	-	+1,909	+2.6

‡ Elevation at 2400.
* Estimated.

4-1618. Stony Creek near Washington, Mich.

Location.--Lat 42°42'55", long 83°05'31", in SW¼ sec. 31, T.4 N., R.12 E., on left bank 15 ft downstream from bridge on Mt. Vernon Road, 500 ft downstream from Stony Lake dam, and 2.9 miles west of Washington.

Drainage area.--68.0 sq mi.

Records available.--July 1958 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 772.59 ft above mean sea level, datum of 1929 (levels by Huron-Clinton Metropolitan Authority). Prior to May 16, 1968, graphic water-stage recorder at same site and datum.

Average discharge.--10 years, 31.9 cfs (adjusted for storage since 1963).

Extremes.--Maximum discharge during year, 427 cfs Feb. 2 (gage height, 5.86 ft); minimum, 5.4 cfs Nov. 30 (gage height, 2.40 ft). 1958-68: Maximum discharge, that of Feb. 2, 1968; maximum gage height, 6.71 ft Mar. 6, 1959 (ice jam); minimum discharge, 0.9 cfs July 10, 1963; minimum gage height, 1.84 ft July 31, 1964; minimum daily discharge, 1.3 cfs July 31, Aug. 1, 1964.

Remarks.-- Records good. Occasional diurnal fluctuation caused by mills above station prior to February 1963; occasional regulation by Stony Lake since (see sta. no 4-1617.9).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	17	53	5.4	62	206	38	68	33	128	112	34	34
2	17	60	5.9	58	407	39	46	23	108	87	38	33
3	18	67	6.1	31	381	37	40	20	85	70	36	35
4	18	72	6.3	28	335	38	35	26	74	64	28	31
5	18	72	6.5	34	293	41	31	33	65	59	21	25
6	18	71	6.5	35	246	44	30	24	57	51	17	21
7	18	70	6.5	35	208	44	30	17	49	58	16	28
8	19	69	6.5	35	169	45	29	24	41	95	28	36
9	22	68	6.5	34	147	51	49	30	35	83	26	39
10	22	68	6.8	34	115	65	56	21	32	82	20	36
11	22	68	16	33	100	73	32	20	30	78	17	36
12	22	67	32	31	90	76	35	24	30	72	16	36
13	28	67	55	30	80	64	43	26	24	57	15	36
14	32	67	77	31	70	61	51	28	25	45	15	36
15	33	65	67	34	62	61	33	31	28	37	14	36
16	37	65	61	34	56	81	38	24	26	33	27	36
17	40	64	56	34	52	103	27	25	24	35	22	36
18	42	62	54	34	50	110	35	29	22	33	30	36
19	44	61	57	35	47	110	26	35	23	28	35	36
20	46	48	57	36	45	112	28	29	20	28	32	36
21	47	36	104	37	43	115	41	29	21	26	25	36
22	46	33	220	38	41	116	30	32	21	26	22	36
23	45	32	216	38	39	113	32	33	22	24	18	36
24	46	32	184	36	38	94	28	26	27	20	14	37
25	50	32	157	35	37	90	35	13	220	18	12	37
26	51	32	128	34	36	112	31	18	270	24	9.8	37
27	50	27	97	33	36	160	28	69	235	23	9.6	36
28	49	14	86	37	38	175	36	166	186	21	9.1	36
29	48	6.1	80	54	38	108	25	185	156	19	9.2	36
30	51	5.4	79	124	------	82	28	168	135	19	18	36
31	51	------	70	136	------	107	------	147	------	24	36	------
TOTAL	1,067	1,553.5	2,016.0	1,320	3,505	2,565	1,076	1,408	2,219	1,451	669.7	1,041
MEAN	34.4	51.8	65.0	42.6	121	82.7	35.9	45.4	74.0	46.8	21.6	34.7
MAX	51	72	220	136	407	175	68	185	270	112	38	39
MIN	17	5.4	5.4	28	36	37	25	13	20	18	9.1	21
+	+1.8	-7.2	+14.7	+3.4	-2.9	+6.3	+20.8	+11.5	0	-4.1	-1.6	-11.7
MEAN‡	36.2	44.6	79.7	46.0	118	89.0	56.7	56.9	74.0	42.7	20.0	23.0
CFSM‡	.53	.65	1.17	.67	1.73	1.30	.83	.83	1.09	.63	.29	.34
IN.‡	.61	.73	1.35	.78	1.87	1.50	.93	.96	1.21	.72	.34	.38

CAL YR 1967:	TOTAL	18,934.1	MEAN	51.9	MAX	220	MIN	5.4	MEAN‡	49.9	CFSM‡	.73	IN.‡	9.93
WTR YR 1968:	TOTAL	19,891.2	MEAN	54.3	MAX	407	MIN	5.4	MEAN‡	56.9	CFSM‡	.83	IN.‡	11.33

\+ Change in contents, equivalent in cubic feet per second in Stony Lake.
‡ Adjusted for change in contents in Stony Lake.

4-1629. Big Beaver Creek near Warren, Mich.

Location.--Lat 42°32'31", long 83°02'52", in NW¼ SW¼ sec.33, T.2 N., R.12 E., on left bank at downstream side of bridge on Mound Road, 1.0 mile north of Warren and 2.0 miles upstream from mouth.

Drainage area.--23.5 sq mi.

Records available.--October 1958 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 598.80 ft above mean sea level, datum of 1929 (Macomb County benchmark). Prior to Aug. 26, 1960, wire-weight gage and crest-stage gage and Aug. 26, 1960, to Sept. 28, 1966, graphic water-stage recorder, at same site and datum.

Average discharge.--10 years, 12.9 cfs.

Extremes.--Maximum discharge during year, 1,240 cfs June 26 (gage height, 14.45 ft); minimum, 0.71 cfs Oct. 7; minimum gage height, 4.76 ft Aug. 29, 30.

1958-68: Maximum discharge, that of June 26, 1968; minimum, no flow on several days in June and July 1962, caused by unusual regulation above gage; minimum natural discharge, 0.1 cfs several days each year in 1959-62.

Remarks.--Records good except those for the winter period, which are poor.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.0	8.5	4.7	3.8	314	1.8	19	8.7	20	21	19	12
2	1.1	82	6.1	3.3	616	1.8	16	7.1	16	14	6.2	25
3	.91	39	28	3.0	110	1.8	13	6.9	12	9.6	4.7	9.8
4	.87	58	19	2.8	25	1.8	222	6.2	9.1	7.0	2.8	7.0
5	.79	24	15	2.6	15	1.8	57	9.6	8.0	8.0	2.3	11
6	.75	15	21	2.5	12	1.9	27	7.7	6.2	14	4.3	8.1
7	.75	14	40	2.4	10	1.9	20	6.1	4.9	8.0	8.3	4.9
8	4.1	8.7	43	2.3	8.0	2.1	17	5.2	4.5	6.0	6.7	3.7
9	28	7.1	23	2.3	6.7	2.5	14	8.4	3.8	22	5.4	3.4
10	4.7	6.1	28	2.3	5.5	4.5	11	9.3	3.3	274	4.4	4.4
11	1.7	9.5	203	2.2	4.5	4.1	11	6.0	3.1	35	2.8	5.0
12	1.2	25	161	2.2	4.1	3.9	8.4	7.3	4.3	16	2.0	4.6
13	1.1	18	56	2.2	3.8	3.9	7.3	6.9	3.8	9.9	1.9	3.6
14	1.4	13	31	2.3	3.3	4.5	9.6	6.0	2.6	6.5	2.0	3.0
15	7.0	12	19	2.3	3.0	7.3	49	8.6	2.1	5.4	1.8	2.7
16	40	7.9	15	2.4	2.7	37	18	19	1.7	4.5	11	2.4
17	65	7.5	13	2.6	2.5	14	14	16	2.0	7.0	101	3.0
18	92	13	23	2.8	2.4	27	12	8.6	2.7	5.2	17	2.7
19	20	16	58	3.0	2.3	23	11	9.7	2.4	6.5	41	3.4
20	9.6	10	28	3.2	2.3	34	9.3	11	2.2	4.3	22	3.5
21	5.8	8.9	336	3.2	2.1	39	8.8	7.3	2.3	2.8	8.9	4.4
22	4.3	11	595	3.2	2.0	40	8.0	7.8	2.9	2.3	9.2	4.0
23	3.5	14	98	3.1	2.0	20	45	6.9	2.7	2.2	7.5	11
24	4.5	11	35	2.8	2.0	21	116	5.5	4.2	2.1	4.6	9.1
25	3.5	9.2	18	2.7	1.9	51	29	4.3	121	9.3	5.0	9.6
26	2.8	7.3	11	2.9	1.9	213	20	18	1,050	5.2	4.1	5.5
27	8.0	6.1	8.0	3.5	1.9	156	15	656	246	3.6	3.6	3.9
28	18	5.7	6.8	11	1.8	54	13	628	57	5.2	3.0	3.0
29	8.0	5.9	5.6	40	1.8	37	9.8	125	37	3.6	2.2	2.1
30	4.9	4.4	5.0	150	------	27	9.6	50	33	3.3	2.4	1.8
31	4.9	------	4.3	90	------	22	------	35	------	5.2	2.4	------
TOTAL	351.17	477.8	1,957.5	364.9	1,170.5	925.6	839.8	1,718.1	1,670.8	528.7	319.5	177.6
MEAN	11.3	15.9	63.1	11.8	40.4	29.9	28.0	55.4	55.7	17.1	10.3	5.92
MAX	92	82	595	150	616	213	222	656	1,050	274	101	25
MIN	.75	4.4	4.3	2.2	1.8	1.8	7.3	4.3	1.7	2.1	1.8	1.8
CFSM	.48	.68	2.69	.50	1.72	1.27	1.19	2.36	2.37	.73	.44	.25
IN.	.56	.76	3.10	.58	1.85	1.46	1.33	2.72	2.64	.84	.51	.28

CAL YR 1967 TOTAL 7,894.19 MEAN 21.6 MAX 595 MIN .65 CFSM .92 IN 12.49
WTR YR 1968 TOTAL 10,501.97 MEAN 28.7 MAX 1,050 MIN .75 CFSM 1.22 IN 16.62

PEAK DISCHARGE (BASE, 300 cfs)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-22	0100	13.25	990	5-27	2400	12.87	914
2-2	0300	12.66	872	6-26	0800	14.45	1,240
3-26	2200	9.79	368	7-10	0700	10.44	466
4-4	1300	9.97	396				

4-1634. Plum Brook at Utica, Mich.

Location.--Lat 42°36'05", long 83°04'27", in SE1/4NE1/4 sec.7, T.2 N., R.12 E., on left bank at upstream side of bridge on Ryan Road, 1.0 mile southwest of Utica.

Drainage area.--16.1 sq mi.

Records available.--July 1965 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 625 ft (from topographic map).

Extremes.--Maximum discharge during year, 1,160 cfs June 26 (gage height, 10.36 ft); minimum, 0.17 cfs Oct. 7 (gage height, 1.26 ft).
1965-68: Maximum discharge, 1,160 cfs June 26, 1968 (gage height, 10.36 ft); no flow for part of July 19, 28, 1966; minimum gage height, 1.23 ft Sept. 16, 1967.

Remarks.--Records good except those for winter period, which are poor. Occasional diversion for sprinkler irrigation.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	1.5	7.5	5.6	3.8	311	1.7	21	6.6	24	19	7.4	12
2	1.1	50	6.4	3.4	422	1.7	16	5.7	19	13	3.4	22
3	.80	28	10	3.1	79	1.7	16	5.0	12	9.6	2.3	8.3
4	.68	41	13	2.8	40	1.7	138	4.7	8.9	7.6	2.0	5.7
5	.57	19	13	2.6	15	1.7	53	6.3	6.8	11	2.1	5.5
6	.57	13	15	2.5	12	1.7	31	5.5	5.4	16	2.9	4.8
7	.52	11	28	2.4	9.0	1.8	23	4.1	4.6	8.3	7.1	4.0
8	1.1	10	27	2.3	8.0	2.0	18	4.7	4.1	7.4	5.2	3.3
9	9.7	9.0	17	2.2	6.0	2.5	11	6.4	3.3	81	4.6	2.9
10	3.2	8.0	22	2.2	5.6	3.0	9.2	6.8	2.9	201	3.5	3.8
11	1.9	13	99	2.2	5.0	3.0	7.8	5.0	3.5	44	2.3	4.6
12	1.6	21	88	2.1	4.1	2.7	7.0	6.3	5.2	21	1.8	5.4
13	1.3	14	38	2.1	3.6	2.7	6.1	5.9	3.4	13	1.6	4.1
14	1.4	12	25	2.1	3.3	3.5	15	5.7	2.7	8.9	1.5	3.1
15	2.1	11	13	2.2	3.0	7.0	54	8.3	2.7	7.0	1.2	2.5
16	12	8.1	10	2.3	2.8	30	21	14	2.5	5.7	2.1	2.1
17	28	8.3	9.0	2.5	2.5	26	13	12	5.7	4.7	30	1.8
18	34	14	21	2.6	2.4	23	11	7.2	6.6	4.4	7.4	1.5
19	12	13	38	2.9	2.2	20	9.2	9.2	2.7	4.2	18	2.3
20	8.0	11	20	3.1	2.1	22	7.4	11	2.9	3.4	11	2.4
21	6.6	9.7	186	3.1	2.0	26	8.1	6.0	3.1	2.9	5.9	2.5
22	5.2	11	251	3.1	2.0	20	7.2	6.6	2.7	2.5	4.8	2.1
23	4.5	14	55	3.0	1.9	17	34	5.6	2.7	2.3	3.8	6.6
24	3.9	11	25	2.7	1.9	22	66	4.5	2.9	6.3	3.1	5.0
25	3.8	11	14	2.7	1.8	30	27	3.5	31	5.0	3.6	8.1
26	3.5	9.2	10	2.7	1.8	130	18	25	707	3.3	2.8	4.7
27	7.4	7.8	8.4	3.5	1.8	113	12	450	126	3.1	2.2	4.0
28	12	6.0	7.0	20	1.8	58	8.7	432	50	3.1	1.9	3.1
29	7.8	6.4	5.8	50	1.7	42	7.4	83	37	2.5	1.6	2.5
30	6.4	5.0	5.0	110	------	32	8.1	48	32	2.3	1.5	2.7
31	5.5	------	4.3	60	------	26	------	33	------	3.0	1.5	------
TOTAL	188.64	413.0	1,090.5	312.2	955.3	675.4	684.2	1,237.6	1,123.3	526.5	150.1	143.4
MEAN	6.09	13.8	35.2	10.1	32.9	21.8	22.8	39.9	37.4	17.0	4.84	4.78
MAX	34	50	251	110	422	130	138	450	707	201	30	22
MIN	.52	5.0	4.3	2.1	1.7	1.7	6.1	3.5	2.5	2.3	1.2	1.5
CFSM	.38	.86	2.18	.63	2.05	1.35	1.42	2.48	2.33	1.05	.30	.30
IN.	.44	.95	2.52	.72	2.21	1.56	1.58	2.86	2.59	1.22	.35	.33

CAL YR 1967: TOTAL 4,831.06 MEAN 13.2 MAX 251 MIN .17 CFSM .82 IN 11.16
WAT YR 1968: TOTAL 7,500.14 MEAN 20.5 MAX 707 MIN .52 CFSM 1.27 IN 17.32

PEAK DISCHARGE (BASE, 200 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-22	0100	8.81	386	05-28	0200	8.92	596
02-01	2330	9.37	740	06-26	0700	10.36	1,160
03-26	2300	6.70	234	07-10	0200	8.46	344
04-04	1100	6.47	214				

4-1640. Clinton River near Fraser, Mich.

Location.--Lat 42°34'40", long 82°57'00", in NW¼ sec. 20, T.2 N., R.13 E., on left bank 800 ft downstream from bridge on Garfield Road, 2-3/4 miles north of Fraser, and 4 miles upstream from North Branch.

Drainage area.--445 sq mi.

Records available.--May 1947 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 577.71 ft above mean sea level, datum of 1929. Prior to Nov. 17, 1949, wire-weight gage at site 800 ft upstream at same datum, and Nov. 17, 1949, to Apr. 21, 1965, graphic water-stage recorder at present site and datum.

Average discharge.--21 years, 331 cfs.

Extremes.--Maximum discharge during year, 7,040 cfs June 26 (gage height, 18.70 ft); minimum, 89 cfs Aug. 5 (gage height, 4.98 ft).
1947-68: Maximum discharge, 8,000 cfs May 11, 1948 (gage height, 19.5 ft, from graph based on gage readings), from rating curve extended above 4,000 cfs; minimum, 47 cfs Sept. 6, 1955; minimum gage height, 4.29 ft Sept. 7, 1954.
Flood of April 5 or 6, 1947 reached a stage of 20 ft, from floodmarks (discharge, 9,000 cfs, from rating curve extended above 4,000 cfs).

Remarks.--Records good. Records of suspended sediment loads for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	180	433	189	424	2,040	313	600	348	736	1,200	511	309
2	170	1,190	250	424	4,820	313	520	372	616	1,000	313	539
3	150	778	554	478	3,130	287	1,000	357	539	800	267	332
4	140	970	388	429	1,860	291	1,500	354	503	650	215	309
5	130	614	355	388	1,410	304	1,500	400	462	500	203	460
6	120	492	384	384	1,200	313	1,000	345	471	700	248	399
7	110	458	497	366	1,050	306	800	316	427	600	343	315
8	110	400	501	350	920	304	650	284	390	500	303	265
9	500	370	413	348	800	334	520	328	301	600	566	240
10	210	348	447	364	690	345	526	289	262	2,000	248	316
11	175	413	1,400	355	608	350	528	281	292	1,370	200	299
12	163	496	1,320	325	573	354	482	284	391	736	181	286
13	163	426	843	330	535	341	449	255	316	587	184	270
14	184	411	618	345	522	343	473	252	279	511	195	240
15	284	440	534	364	505	354	742	281	343	465	216	226
16	915	413	462	343	492	1,120	554	553	235	640	315	218
17	1,220	426	415	354	463	764	484	354	236	564	2,860	224
18	1,680	467	478	368	422	579	451	267	218	440	768	207
19	513	451	664	444	417	556	445	275	199	471	604	252
20	352	399	558	397	429	614	417	306	191	372	746	270
21	303	372	2,260	350	388	698	406	255	187	316	499	274
22	270	388	4,210	336	395	726	399	272	299	299	424	272
23	257	400	2,180	352	386	646	594	247	186	296	390	327
24	269	364	1,290	308	379	632	1,030	235	238	776	346	325
25	313	352	903	277	348	724	530	208	1,410	418	325	390
26	325	318	810	301	334	1,500	420	379	5,690	327	296	308
27	462	306	690	294	343	1,900	372	3,460	4,140	343	287	282
28	528	289	658	913	345	1,200	352	4,590	2,240	454	277	262
29	420	218	600	1,530	330	1,000	337	2,390	1,560	292	281	267
30	370	194	553	2,380	------	850	346	1,390	1,360	272	264	267
31	368	------	515	1,420	------	750	------	923	------	292	265	------
TOTAL	11,354	13,596	25,939	16,041	26,134	19,111	18,427	20,850	24,717	18,791	13,140	8,950
MEAN	366	453	837	517	901	616	614	673	824	606	424	298
MAX	1,680	1,190	4,210	2,380	4,820	1,900	1,500	4,590	5,690	2,000	2,860	539
MIN	110	194	189	277	330	287	337	208	186	272	181	207
CFSM	.82	1.02	1.88	1.16	2.03	1.39	1.38	1.51	1.85	1.36	.95	.67
IN.	.95	1.14	2.17	1.34	2.18	1.60	1.54	1.74	2.07	1.57	1.10	.75

CAL YR 1967 TOTAL 171,601 MEAN 470 MAX 4,210 MIN 110 CFSM 1.06 IN 14.34
WTR YR 1968 TOTAL 217,050 MEAN 593 MAX 5,690 MIN 110 CFSM 1.33 IN 18.14

PEAK DISCHARGE (BASE, 2,000 cfs)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-21	2200	16.44	5,520	06-26	unknown	18.70	7,040
02-02	1600	16.20	5,210	07-10	unknown	unknown	2,100
05-28	0500	16.17	5,170	08-17	0700	16.15	4,300

4-1640.1. North Branch Clinton River at Almont, Mich.

Location.--Lat 42°54'59", long 83°02'42", in NE 1/4 sec.28, T.6 N., R.12 E., on left bank, 20 ft upstream from bridge on State Highway 53 at Almont.

Drainage area.--9.56 sq mi.

Records available.--Water years 1959-62 (annual maximum and occasional low flow measurements), October 1962 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 830 ft (from topographic map). Oct. 27, 1958, to Oct. 10, 1962, crest-stage gage and staff gage at same datum. Oct. 11, 1962, to Sept. 16, 1963, water-stage recorder and concrete control at site 400 ft upstream at same datum.

Average discharge.--6 years, 4.78 cfs.

Extremes.--Maximum discharge during year, 351 cfs Feb. 1 (gage height, 5.73 ft); minimum, 1.5 cfs Aug. 29, 30, 31, Sept. 1 (gage height, 1.05 ft).
1958-68: Maximum discharge, 526 cfs Apr. 17, 1967 (gage height, 7.30 ft); minimum not determined; minimum daily, 0.2 cfs Aug. 27-30, 1964.
Flood, probably in February 1938, reached a stage of about 11 ft from information by local resident.

Remarks.--Records good except those for the winter periods, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	2.4	3.6	1.8	4.0	195	2.3	9.6	4.6	9.2	12	3.6	2.4
2	1.9	10	2.1	4.4	189	2.2	8.2	4.1	8.2	8.9	2.6	3.8
3	1.9	7.8	4.1	4.4	42	2.0	7.8	4.6	5.9	7.2	1.9	2.9
4	1.9	11	3.8	3.5	34	2.5	19	4.9	4.6	5.6	1.8	2.1
5	1.9	6.2	3.8	3.1	24	3.5	13	4.6	3.8	4.9	1.9	3.6
6	1.9	4.9	4.9	3.0	19	4.0	9.6	4.1	3.1	4.6	2.4	3.1
7	2.6	4.1	6.5	2.9	14	5.0	8.6	3.6	2.6	3.6	13	1.9
8	4.3	3.6	6.9	2.6	13	6.0	7.5	3.6	2.6	3.3	7.5	1.9
9	6.9	3.8	5.9	2.7	11	11	5.9	3.8	2.6	12	6.9	1.9
10	4.1	3.6	6.2	2.7	12	13	6.2	3.6	2.9	36	4.3	6.2
11	3.6	5.6	18	2.7	7.8	11	6.2	3.6	2.9	12	2.9	5.3
12	3.6	7.8	20	2.7	6.0	7.8	6.2	4.3	3.3	8.2	2.4	4.1
13	4.6	6.2	12	2.7	5.0	6.0	5.9	5.3	3.1	5.9	2.1	2.6
14	6.2	5.6	8.6	2.7	4.3	6.0	8.9	5.9	2.9	4.3	1.9	2.1
15	7.2	4.9	7.8	2.8	4.0	9.0	13	6.5	3.1	3.8	1.8	1.8
16	13	3.8	5.3	3.0	3.6	30	7.8	7.2	2.9	4.9	1.8	1.7
17	14	3.8	4.6	3.2	3.2	19	5.9	4.9	2.6	5.6	3.1	1.7
18	10	5.6	5.6	3.5	3.0	16	6.5	4.1	2.6	4.3	2.1	1.7
19	3.8	4.9	6.9	3.7	2.9	14	5.9	6.9	3.3	6.2	10	1.8
20	2.6	3.8	5.3	3.9	2.7	17	5.6	6.9	3.6	3.8	5.6	1.9
21	1.9	3.6	90	4.1	2.6	15	6.5	8.2	2.4	2.9	2.9	1.7
22	1.9	3.8	67	4.2	2.5	11	5.3	8.2	2.9	2.6	2.1	1.7
23	1.7	4.3	20	4.1	2.4	7.8	8.6	5.6	2.4	2.1	1.8	1.9
24	1.7	3.6	13	3.6	2.3	9.6	12	4.1	3.1	2.6	1.7	3.3
25	1.7	3.6	11	3.4	2.3	15	8.6	2.9	42	2.6	1.7	5.6
26	1.7	3.6	12	3.4	2.3	58	7.2	3.8	113	1.9	1.7	2.9
27	4.5	2.9	8.2	4.0	2.3	34	6.2	36	40	2.4	1.7	2.6
28	6.2	2.4	6.9	10	2.3	22	4.9	44	20	3.6	1.6	2.1
29	3.6	1.9	6.2	30	2.3	16	5.3	22	24	2.1	1.6	2.1
30	3.1	1.9	5.3	50	------	13	5.6	16	22	1.8	1.6	1.9
31	2.4	------	4.9	42	------	11	------	12	------	2.4	1.6	------
TOTAL	128.8	142.2	384.6	223.0	616.8	399.7	237.5	259.9	347.6	184.1	99.6	80.3
MEAN	4.15	4.74	12.4	7.19	21.3	12.9	7.92	8.38	11.6	5.94	3.21	2.68
MAX	14	11	90	50	195	58	19	44	113	36	13	6.2
MIN	1.7	1.9	1.8	2.6	2.3	2.0	4.9	2.9	2.4	1.8	1.6	1.7
CFSM	.43	.50	1.30	.75	2.22	1.35	.83	.88	1.21	.62	.34	.28
IN.	.50	.55	1.50	.87	2.40	1.55	.92	1.01	1.35	.72	.39	.31

CAL YR 1967: TOTAL 2,980.4 MEAN 8.17 MAX 229 MIN 1.3 CFSM .85 IN 11.59
WAT YR 1968: TOTAL 3,104.1 MEAN 8.48 MAX 195 MIN 1.6 CFSM .89 IN 12.08

PEAK DISCHARGE (BASE, 80 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-21	2100	3.80	173	03-26	1900	2.98	104
02-01	1900	5.73	351	06-26	0030	4.43	228

4-1640.5. North Branch Clinton River near Romeo, Mich.

Location.--Lat 42°49'11", long 82°58'35", in NW¼ sec. 31, T.5 N., R.13 E., on right bank at downstream side of bridge on 33-Mile Rd. 2.2 miles northeast of Romeo.

Drainage area.--49.7 sq mi.

Records available.--Water years 1959-64 (annual maximum and occasional low-flow measurements), October 1964 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 730 ft (from topographic map). Nov. 6, 1958, to Sept. 22, 1964, crest-stage gage and staff gage at site 40 ft upstream at different datum.

Extremes.--Maximum discharge during year, 2,630 cfs Feb. 2 (gage height, 6.03 ft); minimum, 4.0 cfs about Aug. 31; minimum gage height, 1.53 ft Oct. 7.

1958-68: Maximum discharge, that of Feb. 2, 1968; maximum gage height, 7.1 ft during period Mar. 12-13, 1962 (ice jam), site and datum then in use.

1964-68: Minimum discharge, 0.3 cfs July 24, 25, 1965; minimum gage height, 0.97 ft sometime in October 1964.

Remarks.--Records good except those for the winter periodsand those for periods of no gage-height record, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	7.5	17	16	21	1,040	12	60	19	43	66	14	4.5
2	6.6	62	18	23	1,650	11	49	18	37	36	11	9.3
3	6.2	59	22	23	600	10	43	19	28	26	8.8	9.7
4	6.2	96	25	19	300	14	120	19	23	22	7.5	9.0
5	5.8	59	20	16	200	18	106	17	20	19	7.5	8.9
6	5.3	38	24	16	140	22	58	16	18	19	7.9	9.7
7	4.9	30	33	15	110	25	49	15	15	16	22	8.0
8	6.2	25	41	14	90	30	43	15	14	14	26	6.7
9	16	24	36	14	64	57	35	15	14	62	15	6.6
10	10	22	33	14	45	67	31	14	13	120	13	7.0
11	7.9	28	144	14	40	55	28	13	15	71	9.2	9.0
12	7.0	51	206	14	30	42	26	13	15	31	7.9	9.0
13	6.6	41	112	14	25	30	25	13	13	22	7.5	9.0
14	7.0	34	60	14	22	31	34	13	11	18	6.6	8.0
15	8.3	31	46	15	21	40	54	16	10	16	6.6	7.0
16	30	26	43	15	20	107	34	17	10	58	6.6	6.0
17	40	24	34	17	17	154	28	17	9.2	34	8.8	5.8
18	64	29	36	18	16	102	28	13	9.2	20	8.8	6.0
19	36	29	50	19	15	84	26	17	9.2	19	17	6.2
20	22	23	41	21	14	102	26	20	12	16	25	6.6
21	16	22	526	22	13	98	27	20	11	12	12	6.6
22	14	24	731	22	13	86	24	25	11	10	8.8	5.3
23	13	25	350	23	12	56	29	20	10	9.2	7.9	5.3
24	12	23	160	20	12	50	40	16	11	10	7.0	7.5
25	11	22	90	18	12	71	30	13	51	11	6.2	21
26	11	20	66	18	12	312	25	12	554	9.7	5.6	11
27	16	18	50	35	12	490	22	90	396	8.8	5.0	9.0
28	34	16	40	120	12	240	20	316	143	11	5.2	7.6
29	23	18	35	150	12	134	20	194	74	9.7	4.8	6.4
30	18	14	31	210	------	82	22	96	94	8.3	5.6	6.0
31	16	------	27	270	------	68	------	61	------	8.8	5.6	------
TOTAL	487.5	950	3,146	1,244	4,569	2,700	1,162	1,182	1,693.6	813.5	310.4	237.7
MEAN	15.7	31.7	101	40.1	158	87.1	38.7	38.1	56.5	26.2	10.0	7.92
MAX	64	96	731	270	1,650	490	120	316	554	120	26	21
MIN	4.9	14	16	14	12	10	20	12	9.2	8.3	4.8	4.5
CFSM	.32	.64	2.04	.81	3.17	1.75	.78	.77	1.14	.53	.20	.16
IN.	.36	.71	2.35	.93	3.42	2.02	.87	.88	1.27	.61	.23	.18

CAL YR 1967: TOTAL 19,466.6 MEAN 53.3 MAX 801 MIN 4.3 CFSM 1.07 IN 14.57
WAT YR 1968: TOTAL 18,495.7 MEAN 50.5 MAX 1,650 MIN 4.5 CFSM 1.02 IN 13.84

PEAK DISCHARGE (BASE, 400 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-22	0030	4.67	986	03-27	0300	4.11	596
02-02	0300	6.03	2,630	06-26	1500	4.28	698

Note.--No gage-height record Dec. 23 to Jan. 22, Feb. 3 to Mar. 8.

4-1641. East Pond Creek at Romeo, Mich.

Location.--Lat 42°49'21", long 83°01'13", in NE¼ SE¼ sec. 27, T.5 N., R.12 E., on right bank 10 ft upstream from bridge on State Highway 53, and 1.4 miles north of Romeo.

Drainage area.--21.8 sq mi.

Records available.--September 1958 to September 1968.

Gage.--Digital water-stage recorder. Altitude of gage is 780 ft (from topographic map). Prior to Nov. 14, 1967, graphic water-stage recorder at same site and datum.

Average discharge.--10 years, 11.6 cfs.

Extremes.--Maximum discharge during year, 318 cfs Feb. 1 (gage height, 4.16 ft); minimum, 3.1 cfs Oct. 5 (gage height, 0.96 ft). 1958-68: Maximum discharge, 358 cfs Feb. 10, 1965 (gage height, 4.48 ft); maximum gage height, 4.56 ft Mar. 12, 1962 (ice jam); minimum discharge, 0.8 cfs July 30, 31, 1964, Aug. 6, 7, 1965; minimum gage height, 0.71 ft July 21, 1959.

Remarks.--Records good except those for the winter period, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.5	13	8.3	17	302	9.2	37	16	32	35	14	8.0
2	4.6	24	8.0	15	254	9.2	34	15	29	29	9.8	16
3	4.2	21	8.2	13	188	10	31	14	25	24	8.5	12
4	3.3	24	9.0	12	146	9.9	41	15	22	21	7.6	9.8
5	3.1	19	10	11	117	9.2	38	14	19	20	7.6	13
6	4.2	16	11	10	91	9.2	33	13	17	23	8.5	12
7	4.6	15	14	9.4	65	9.5	31	12	14	16	20	8.9
8	6.7	13	16	9.2	58	10	29	12	13	13	17	8.0
9	13	13	19	9.0	46	15	26	12	12	28	13	7.6
10	9.4	12	22	9.0	36	25	24	11	11	81	12	8.9
11	7.6	14	26	9.0	30	24	23	10	12	35	10	10
12	7.2	16	29	9.0	25	23	22	10	12	26	9.4	12
13	6.3	16	22	9.0	20	20	21	10	10	23	8.9	11
14	7.6	14	17	9.0	17	19	22	11	9.4	21	8.0	8.4
15	8.5	13	15	9.0	16	23	26	12	8.5	19	7.6	7.8
16	19	12	14	9.0	15	38	23	13	8.5	18	7.2	7.8
17	23	12	14	9.0	14	41	22	12	8.0	17	9.8	7.4
18	28	13	14	9.0	13	35	23	11	7.6	15	8.5	7.2
19	16	13	14	9.0	13	34	22	14	7.6	14	16	8.0
20	13	12	14	9.0	12	36	21	13	7.6	12	14	8.9
21	12	11	50	9.0	11	35	22	13	7.6	11	10	8.5
22	10	11	80	9.2	11	32	20	15	8.0	11	9.4	7.6
23	9.8	11	80	9.4	10	29	21	14	7.6	10	8.5	8.0
24	9.4	11	60	10	10	27	26	12	8.5	12	8.0	9.4
25	9.8	11	45	11	9.6	31	23	11	23	12	7.6	16
26	8.9	10	45	11	9.5	47	20	12	127	9.8	6.7	10
27	9.8	9.8	40	10	9.3	62	20	47	66	9.4	6.3	9.4
28	15	9.7	30	15	9.2	53	18	70	46	10	5.9	8.6
29	13	9.2	26	35	9.2	48	17	44	42	8.9	5.5	8.0
30	13	8.5	22	50	------	43	18	38	43	8.5	5.5	9.0
31	12	------	20	45	------	39	------	35	------	8.9	5.0	------
TOTAL	317.5	407.2	802.5	419.2	1,566.8	855.2	754	561	663.9	601.5	295.8	287.2
MEAN	10.2	13.6	25.9	13.5	54.0	27.6	25.1	18.1	22.1	19.4	9.54	9.57
MAX	28	24	80	50	302	62	41	70	127	81	20	16
MIN	3.1	8.5	8.0	9.0	9.2	9.2	17	10	7.6	8.5	5.0	7.2
CFSM	.47	.62	1.19	.62	2.48	1.27	1.15	.83	1.02	.89	.44	.44
IN.	.54	.69	1.37	.72	2.67	1.46	1.29	.96	1.13	1.03	.50	.49

CAL YR 1967	TOTAL 6,806.2	MEAN 18.6	MAX 130	MIN 2.6	CFSM .86	IN 11.61
WTR YR 1968	TOTAL 7,531.8	MEAN 20.6	MAX 302	MIN 3.1	CFSM .94	IN 12.85

PEAK DISCHARGE (BASE, 80 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-22	unknown	unknown	unknown	05-28	0100	2.23	85
02-01	2300	4.16	318	06-26	0400	3.01	165
				07-10	0200	2.50	112

4-1641.5. North Branch Clinton River near Meade, Mich.

Location.--Lat 42°43'50", long 82°54'23", in NE1/4 sec.34, T.4 N., R.13 E., on left bank at downstream side of bridge on 27-Mile Road, 1.9 miles northwest of Meade.

Drainage area.--89.6 sq mi.

Records available.--Water years 1959-67 (annual maximum), October 1967 to September 1968.

Gage.--Water-stage recorder. Altitude of gage 615 ft (from topographic map).

Extremes.--Maximum discharge during year, 4,380 cfs Feb. 2 (gage height, 7.53 ft); minimum, 0.2 cfs Aug. 27 (gage height, 0.64 ft).
1959-68: Maximum discharge, that of Feb. 2, 1968; maximum gage height, 7.85 ft Mar. 13, 1962 (ice jam).

Remarks.--Records good except those for the winter period, which are fair. Occasional regulation at low flow by mill pond above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	10	35	17	36	1,040	17	146	51	117	159	25	3.6
2	10	110	20	33	3,200	16	121	45	98	97	26	20
3	9.0	141	27	30	1,260	15	110	43	79	70	20	26
4	8.0	184	30	28	674	19	256	43	64	56	17	20
5	8.0	141	25	26	462	25	244	44	54	51	16	19
6	7.0	86	28	24	342	32	148	40	46	71	18	26
7	7.0	66	39	23	255	35	117	36	40	48	42	20
8	8.0	55	51	22	190	45	104	35	35	37	63	15
9	10	49	43	21	150	70	87	36	32	36	41	13
10	18	44	38	20	110	90	76	37	30	370	35	15
11	17	50	184	20	80	90	70	34	33	196	28	21
12	14	94	318	20	60	60	66	33	34	91	23	22
13	11	86	218	20	40	60	61	34	32	64	20	20
14	10	66	96	20	35	72	62	33	26	53	18	18
15	12	52	53	20	30	81	83	38	25	45	17	17
16	40	47	43	21	28	175	82	41	23	60	16	14
17	89	44	40	23	25	254	71	45	22	82	20	13
18	142	51	48	25	22	201	67	38	20	48	21	12
19	91	54	84	27	21	166	66	38	19	41	27	14
20	50	40	64	29	20	184	61	51	20	36	50	15
21	35	33	489	30	19	202	62	47	22	33	32	15
22	29	35	1,280	30	18	187	62	55	21	26	23	13
23	25	39	535	30	18	115	67	52	20	23	19	14
24	23	35	213	28	17	105	98	43	21	24	16	14
25	22	32	134	26	17	135	86	36	70	26	14	24
26	22	28	100	26	17	358	69	33	1,140	23	10	28
27	25	23	80	40	17	663	61	155	880	16	E.5	20
28	56	19	60	100	17	386	53	600	360	20	10	16
29	53	18	50	150	17	264	50	408	195	20	9.4	13
30	40	16	45	350	------	198	51	243	196	18	10	9.8
31	35	------	40	600	------	160	------	160	------	15	11	------
TOTAL	936.0	1,773	4,492	1,898	8,201	4,480	2,757	2,627	3,774	1,955	705.9	510.4
MEAN	30.2	59.1	145	61.2	283	145	91.9	84.7	126	63.1	22.8	17.0
MAX	142	184	1,280	600	3,200	663	256	600	1,140	370	63	28
MIN	7.0	16	17	20	17	15	50	33	19	15	8.5	3.6
CFSM	.34	.66	1.62	.68	3.16	1.61	1.03	.95	1.40	.70	.25	.19
IN.	.39	.74	1.86	.79	3.40	1.86	1.14	1.09	1.57	.81	.29	.21

CAL YR 1967: TOTAL — MEAN — MAX — MIN — CFSM — IN —
WAT YR 1968: TOTAL 34,109.3 MEAN 93.2 MAX 3,200 MIN 3.6 CFSM 1.04 IN 14.16

PEAK DISCHARGE (BASE, 600 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-22	0300	6.56	1,340	05-28	1100	4.98	648
02-02	0400	7.53	4,380	06-26	1200	6.32	1,250
05-27	0700	5.18	723				

4-1642. Coon Creek near Armada, Mich.

Location.--Lat 42°47'41", long 82°52'58", in SW 1/4 sec.1, T.4 N., R.13 E., on right bank at downstream side of bridge on North Road, 3.4 miles south of Armada.

Drainage area.--10.0 sq mi.

Records available.--Water years 1959-65 (annual maximum and occasional low flow measurements), October 1965 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 670 ft (from topographic map).

Extremes.--Maximum discharge during year, 464 cfs June 26; maximum gage height, 6.15 ft Feb. 2; minimum discharge, 0.76 cfs Aug. 28, 29, 30, 31 (gage height, 2.24 ft).
1958-68: Maximum discharge, that of June 26, 1968.
1965-68: Minimum discharge, no flow July 26, 1966.

Remarks.--Records good except those for the winter periods, which are fair. Occasional diversion for sprinkler irrigation.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	1.4	4.6	2.2	3.7	120	1.8	9.8	3.4	5.5	8.4	2.6	.83
2	1.2	22	2.8	3.3	320	1.8	6.9	3.5	4.6	4.7	1.9	1.1
3	.98	19	4.7	3.5	200	1.7	6.3	3.5	3.3	3.3	1.6	.98
4	.90	30	4.1	3.5	100	1.7	34	3.7	2.5	2.4	1.5	.90
5	.90	15	4.4	3.0	50	2.2	24	3.4	2.0	2.4	1.5	1.1
6	.90	7.9	5.9	2.5	30	2.8	9.8	3.1	1.7	2.5	1.6	1.1
7	.83	5.9	9.5	2.4	24	3.1	7.5	2.7	1.5	1.7	45	.90
8	1.5	5.1	12	2.3	17	3.5	6.5	2.7	1.3	1.5	3.3	.86
9	3.5	4.6	9.1	2.1	13	4.0	5.4	2.8	1.2	23	2.7	.83
10	2.1	4.3	9.3	2.1	10	4.5	4.9	2.7	1.1	41	2.3	1.1
11	1.5	6.3	48	2.1	7.0	5.0	4.6	2.5	1.9	9.1	1.6	1.3
12	1.3	14	63	2.2	6.0	5.2	4.3	2.6	2.0	5.5	1.5	1.2
13	1.2	9.3	32	2.2	5.0	5.8	4.0	2.5	1.5	4.0	1.4	.98
14	1.3	7.1	12	2.2	4.0	6.6	4.3	2.5	1.2	3.1	1.2	.90
15	1.5	6.5	10	2.2	3.6	13	6.7	2.8	1.2	2.5	1.1	.86
16	4.4	5.1	7.3	2.2	3.2	29	5.1	2.8	1.1	29	1.2	.86
17	12	4.4	5.1	2.3	3.0	22	4.3	2.8	1.1	19	1.5	.86
18	16	4.9	6.7	2.5	2.7	20	4.4	2.5	1.5	6.3	1.3	.83
19	7.1	5.4	13	2.8	2.5	15	4.3	3.0	1.5	4.9	2.0	.98
20	4.7	4.6	8.6	3.0	2.3	21	4.1	3.3	1.7	3.4	2.2	1.1
21	3.7	4.0	197	3.1	2.1	21	4.4	3.4	1.3	2.6	1.5	1.1
22	3.3	4.7	240	3.3	2.0	17	4.1	4.0	1.4	2.3	1.2	1.1
23	2.7	5.5	63	3.3	1.9	7.1	4.4	3.3	1.2	2.0	1.1	.98
24	2.5	4.9	18	3.3	1.8	7.9	6.3	2.8	1.3	2.3	1.1	1.1
25	2.4	4.6	11	3.2	1.8	9.1	4.7	2.3	40	2.2	.90	1.5
26	2.2	4.1	9.3	3.2	1.8	73	4.1	2.6	174	1.9	.83	1.3
27	3.4	3.5	7.1	3.5	1.8	102	3.5	22	86	1.7	.83	1.1
28	5.5	2.8	5.8	9.0	1.8	40	3.3	70	19	1.9	.80	.98
29	4.6	2.7	5.2	30	1.8	23	3.0	36	13	1.6	.80	.90
30	3.8	2.6	4.6	70	------	13	3.7	20	22	1.5	.83	.86
31	3.4	------	4.2	70	------	9.5	------	9.1	------	1.5	.80	------
TOTAL	102.71	225.4	834.9	254.0	940.1	492.3	202.7	234.3	398.6	199.2	89.69	30.49
MEAN	3.31	7.51	26.9	8.19	32.4	15.9	6.76	7.56	13.3	6.43	2.89	1.02
MAX	16	30	240	70	320	102	34	70	174	41	45	1.5
MIN	.83	2.6	2.2	2.1	1.8	1.7	3.0	2.3	1.1	1.5	.80	.83
CFSM	.33	.75	2.69	.82	3.24	1.59	.68	.76	1.33	.64	.29	.10
IN.	.38	.84	3.10	.94	3.50	1.83	.75	.87	1.48	.74	.33	.11

CAL YR 1967: TOTAL 4,433.33 MEAN 12.1 MAX 240 MIN .51 CFSM 1.21 IN 16.49
WAT YR 1968: TOTAL 4,004.39 MEAN 10.9 MAX 320 MIN .80 CFSM 1.09 IN 14.89

PEAK DISCHARGE (BASE, 80 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-21	1100	5.67	394	05-27	1900	4.14	82
02-02	0730	6.15	about 400	06-26	0100	5.87	464
03-26	1500	4.76	169				

4-1643. East Branch Coon Creek at Armada, Mich.

Location.--Lat 42°50'45", long 82°33'06", in NE1/4 sec.23, T.5 N., R.13 E., on right bank 10 ft downstream from bridge on Prospect Street in Armada.

Drainage area.--13.0 sq mi.

Records available.--October 1958 to September 1968.

Gage.--Water-stage recorder and concrete control. Altitude of gage is 735 ft (from topographic map).

Average discharge.--10 years, 5.38 cfs.

Extremes.--Maximum discharge during year, 632 cfs Dec. 21 (gage height, 5.70 ft); minimum, 0.08 cfs Sept. 16, 17, 18 (gage height, 1.21 ft).
1958-68: Maximum discharge, 751 cfs Apr. 17, 1967 (gage height, 6.14 ft); no flow Jan. 25 to Feb. 10, 1961, result of freezeup .

Remarks.--Records good except those for the winter period and those below 0.5 cfs, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	.41	2.1	1.5	2.5	196	.62	12	1.4	6.0	11	1.1	.24
2	.32	25	1.6	2.3	426	.60	7.0	1.2	4.6	5.1	.62	.20
3	.24	25	2.5	2.1	184	.56	6.0	1.2	3.4	3.6	.50	.20
4	.20	49	2.3	1.8	110	.52	44	1.2	2.7	2.9	.39	.20
5	.13	20	2.5	1.6	45	.69	24	1.2	2.2	2.2	.39	.39
6	.16	8.8	3.7	1.3	17	.77	9.7	1.1	1.8	1.9	.44	.29
7	.20	5.6	9.2	1.0	9.0	.86	7.0	.91	1.5	1.5	1.5	.20
8	.36	3.9	13	.90	5.6	.94	5.4	.83	1.2	1.2	1.2	.17
9	1.4	3.5	13	.80	4.5	1.0	4.2	.91	1.2	7.0	.91	.11
10	.86	3.3	11	.74	3.7	1.1	3.4	.83	1.6	17	.75	.24
11	.58	7.4	94	.74	3.1	1.2	3.0	.75	1.4	7.4	.50	.24
12	.46	19	102	.74	2.7	1.3	2.9	.75	1.4	3.2	.44	.24
13	.41	14	36	.74	2.3	1.4	2.9	.75	.99	2.1	.39	.20
14	.46	8.8	13	.74	2.0	1.5	2.9	.83	.83	1.6	.24	.17
15	.64	7.0	6.4	.74	1.6	4.4	4.6	.99	.75	1.2	.20	.14
16	2.0	4.4	5.3	.74	1.4	45	3.0	1.1	.75	16	.24	.08
17	7.8	3.7	4.1	.78	1.1	45	2.5	1.1	.75	4.6	.34	.08
18	17	5.0	5.6	.87	.95	30	2.4	.91	.56	2.1	.34	.11
19	9.7	5.6	10	.92	.85	23	2.2	1.1	.68	1.7	1.3	.14
20	3.9	3.9	7.9	1.0	.76	32	1.9	1.4	.83	1.2	1.2	.17
21	2.3	3.3	309	1.1	.70	28	2.2	1.4	.83	.99	.68	.14
22	1.7	3.7	207	1.1	.66	22	1.9	1.5	.75	.75	.50	.17
23	1.4	5.0	55	1.1	.64	4.4	2.2	1.2	.75	.62	.39	.20
24	1.2	4.1	22	1.1	.62	4.9	3.6	.99	.68	.75	.29	.24
25	1.0	3.7	11	1.1	.60	10	2.7	.75	17	.68	.20	.50
26	1.0	3.1	7.0	.92	.60	175	2.2	.75	190	.62	.20	.34
27	1.6	2.5	4.5	.92	.60	153	1.9	21	63	.56	.17	.24
28	3.9	1.8	3.5	1.4	.61	54	1.7	49	24	.68	.14	.17
29	3.3	1.5	3.1	5.0	.62	28	1.5	28	16	.56	.11	.14
30	2.1	1.5	2.9	84	------	14	1.5	16	32	.44	.14	.11
31	1.6	------	2.7	122	------	13	------	8.4	------	.74	.11	------
TOTAL	68.33	255.2	988.3	242.79	1,023.21	698.76	172.4	149.45	380.15	101.89	15.92	6.06
MEAN	2.20	8.51	31.9	7.83	35.3	22.5	5.75	4.82	12.7	3.29	.51	.20
MAX	17	49	309	122	426	175	44	49	190	17	1.5	.50
MIN	.13	1.5	1.5	.74	.60	.52	1.5	.75	.56	.44	.11	.08
CFSM	.17	.65	2.45	.60	2.71	1.73	.44	.37	.97	.25	.04	.02
IN.	.20	.73	2.83	.69	2.93	2.00	.49	.43	1.09	.29	.05	.02

CAL YR 1967: TOTAL 5,462.76 MEAN 15.0 MAX 350 MIN .07 CFSM 1.15 IN 15.63
WAT YR 1968: TOTAL 4,102.46 MEAN 11.2 MAX 426 MIN .08 CFSM .86 IN 11.74

PEAK DISCHARGE (BASE, 100 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-12	0830	3.01	125	03-26	1100	4.90	448
12-21	1200	5.70	632	06-26	0500	4.11	296
02-02	0400	5.26	525				

4-1643.5. Highbank Creek near Armada, Mich.

Location.--Lat 42°48'24", long 82°51'08", in NW¼ sec. 6, T.4 N., R.14 E., on left bank 75 ft downstream from bridge on 32-Mile Road and 3.0 miles southeast of Armada.

Drainage area.--14.9 sq mi.

Records available.--Water years 1959-65 (annual maximum and occasional low-flow measurements), August 1965 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 670 ft (from topographic map).

Extremes.--Maximum discharge during year, about 1,400 cfs Feb. 1; maximum gage height, 16.04 ft Feb. 1 (backwater from ice); minimum discharge, no flow on many days in August and September; minimum gage height, 10.45 ft Oct. 2.
1958-68: Maximum discharge about 1,400 cfs Feb. 1, 1968; maximum gage height, 16.04 ft Feb. 1, 1968, (backwater from ice); no flow at times.

Remarks.--Records fair except those for winter periods and those for period of no gage-height record, which are poor. Occasional diversion for sprinkler irrigation upstream.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	.98	4.0	.95	3.9	400	.92	10	.95	12	9.1	.80	0
2	.69	94	.96	3.6	310	.92	10	.75	7.0	4.2	.57	0
3	.80	54	1.1	3.2	90	.85	8.2	.67	4.1	2.4	.38	.01
4	.85	90	2.0	3.0	70	.80	60	.70	2.2	1.9	.26	.01
5	.80	28	5.6	2.7	35	1.0	41	.67	1.5	1.8	.26	.13
6	.90	12	14	2.4	25	1.1	18	.62	1.2	2.1	.44	.21
7	1.1	6.9	40	2.1	22	1.2	11	.57	.85	1.5	1.2	.10
8	1.9	4.2	43	1.5	18	1.4	8.5	.57	.65	1.1	1.1	.01
9	3.4	3.6	25	1.2	15	1.6	4.4	.65	12	6.1	.80	0
10	1.2	2.9	23	1.1	11	1.8	2.8	.67	54	52	.57	.03
11	.80	10	120	1.1	8.0	2.0	2.2	.62	.70	7.7	.38	.13
12	.70	40	115	1.1	5.0	2.1	1.8	.65	1.0	3.1	.21	.07
13	.70	19	66	1.1	4.0	2.2	1.5	.65	.75	2.0	.17	.07
14	.90	12	27	1.1	3.5	2.8	1.7	.67	.65	1.5	.17	.03
15	1.0	12	16	1.1	3.0	5.0	16	.80	.60	1.2	.13	.01
16	4.1	4.2	7.3	1.1	2.5	15	3.6	.95	5.0	3.3	.13	0
17	25	3.4	5.0	1.2	2.0	50	2.0	1.1	.62	6.1	.26	0
18	44	10	24	1.3	1.6	32	1.9	.80	.60	2.9	.17	0
19	8.7	12	75	1.4	1.3	27	1.7	.85	.62	1.7	.50	0
20	3.0	4.6	32	1.5	1.1	35	1.5	1.2	.80	1.2	.60	0
21	1.8	2.7	453	1.5	1.0	30	21	1.2	.67	.80	.26	0
22	1.2	4.6	200	1.5	.96	20	1.5	1.6	.62	.65	.17	.01
23	.90	12	60	1.5	.92	5.2	4.3	1.2	.62	.57	.13	.01
24	.80	8.0	20	1.4	.90	6.0	27	.90	.62	.60	.10	.01
25	.75	5.4	11	1.4	.90	31	5.2	.65	23	1.1	.07	.01
26	.65	3.5	8.0	1.4	.90	84	2.3	.62	117	.50	.05	.01
27	1.8	2.2	5.6	1.4	.90	76	1.7	39	57	.38	.01	.01
28	5.2	1.6	5.6	2.0	.90	55	1.2	90	20	.44	0	0
29	2.5	1.1	5.2	4.0	.92	46	.95	69	24	.26	0	0
30	1.6	1.1	4.7	20	------	28	1.0	52	44	.17	0	0
31	1.3	------	4.3	80	------	19	------	27	------	.17	0	------
TOTAL	120.02	469.0	1,421.31	152.8	1,036.30	584.89	282.95	298.28	394.37	118.54	9.89	0.87
MEAN	3.87	15.6	45.8	4.93	35.7	18.9	9.43	9.62	13.1	3.82	.32	.029
MAX	44	94	453	80	400	84	60	90	117	52	1.2	.21
MIN	.65	1.1	.95	1.1	.90	.80	.95	.57	.60	.17	0	0
CFSM	.26	1.05	3.08	.33	2.40	1.27	.63	.65	.88	.26	.02	.002
IN.	.30	1.17	3.55	.38	2.59	1.46	.71	.74	.98	.30	.02	.002

CAL YR 1967: TOTAL 4,963.44 MEAN 13.6 MAX 453 MIN .05 CFSM .91 IN 12.39
WAT YR 1968: TOTAL 4,889.22 MEAN 13.4 MAX 453 MIN 0 CFSM .90 IN 12.20

PEAK DISCHARGE (BASE, 200 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-21	1230	15.55	1,190	06-26	0230	15.21	260
02-01	2100	16.04	about 1,400				

Note.--No gage-height record Dec. 22 to Jan 25.

4-1643.6. East Branch Coon Creek near New Haven, Mich.

Location.--Lat 42°45'46", long 82°50'57", in NW 1/4 sec.19, T.4 N., R.14 E., on left bank at downstream side of bridge on 29-Mile Road, 3.4 miles northwest of New Haven.

Drainage area.--36.1 sq mi.

Records available.--Water years 1959-67 (annual maximum and occasional low flow measurements), October 1967 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 630 ft (from topographic map).

Extremes.--Maximum discharge during year, 2,360 cfs Feb. 1 (gage height, 8.46 ft); minimum, 0.09 cfs Sept. 1 (gage height, 1.79 ft).
1958-67: Maximum discharge, 2,360 cfs Feb. 1, 1968.
1967-68: Minimum discharge, 0.09 cfs Sept. 1, 1968 (gage height, 1.79 ft).

Remarks.--Records poor.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	1.4	5.0	6.2	9.3	789	2.5	39	5.8	20	50	3.1	.10
2	1.2	75	6.2	8.5	1,500	2.5	27	5.0	15	21	2.0	.15
3	.80	76	14	7.6	352	2.3	21	4.4	11	12	1.4	.34
4	.64	150	15	7.0	184	2.1	156	4.5	9.5	8.0	1.1	.46
5	.40	60	13	6.2	99	2.7	86	4.3	8.2	6.9	1.1	.46
6	.50	30	18	5.2	63	3.0	37	3.9	7.1	9.8	1.3	.67
7	.60	18	36	4.5	56	3.5	24	3.5	6.1	6.4	4.0	1.1
8	1.0	13	63	3.6	50	3.8	19	3.0	5.2	4.7	5.0	1.2
9	5.0	11	47	3.2	36	4.1	14	3.2	4.7	4.1	3.7	1.3
10	3.0	10	32	3.0	27	4.5	11	3.4	4.1	84	2.6	1.2
11	2.3	20	280	2.9	19	5.0	9.2	3.1	4.4	31	1.7	1.0
12	1.5	58	310	2.9	14	5.3	7.8	2.9	5.6	10	1.2	1.0
13	1.3	40	100	2.9	12	5.7	7.1	2.8	5.1	5.1	.98	1.1
14	1.4	26	50	2.9	9.6	6.0	7.1	2.9	4.4	2.8	.79	1.2
15	2.0	22	20	2.9	9.0	13	10	3.1	3.9	1.7	.67	1.2
16	6.0	15	16	3.0	6.0	133	14	3.7	3.5	10	.63	1.3
17	20	12	12	3.1	5.0	141	9.2	4.1	3.0	42	.75	1.0
18	50	14	18	3.4	4.0	93	8.0	3.4	2.8	15	.75	.80
19	30	19	30	3.7	3.4	68	7.8	2.9	2.6	8.6	1.1	.70
20	15	14	25	4.0	3.0	85	6.8	3.9	2.7	5.6	2.5	.90
21	7.0	11	900	4.2	2.8	86	7.2	4.2	3.1	3.9	1.8	.78
22	5.2	11	475	4.5	2.6	81	7.3	5.0	2.9	2.8	1.1	.90
23	4.5	16	250	4.5	2.5	39	6.9	5.2	2.8	2.2	.75	1.0
24	3.5	16	60	4.5	2.4	19	28	3.8	2.8	2.1	.59	1.3
25	3.0	13	35	4.1	2.4	27	16	2.9	11	2.2	.49	1.8
26	3.5	12	23	3.8	2.4	308	11	2.7	789	1.9	.40	1.6
27	4.5	9.8	19	4.0	2.4	530	8.3	39	247	1.6	.37	1.2
28	12	7.9	15	4.5	2.5	171	6.6	340	85	1.6	.37	.90
29	10	7.0	13	10	2.5	86	5.7	150	43	1.5	.34	.77
30	7.0	6.5	12	350	------	53	5.8	60	94	1.3	.27	.73
31	5.0	------	11	250	------	38	------	30	------	2.0	.15	------
TOTAL	209.24	798.2	2,924.4	733.9	3,262.5	2,023.0	632.8	716.6	1,409.5	361.8	43.00	28.16
MEAN	6.75	26.6	94.3	23.7	113	65.3	21.1	23.1	47.0	11.7	1.39	.94
MAX	50	150	900	350	1,500	530	156	340	789	84	5.0	1.8
MIN	.40	5.0	6.2	2.9	2.4	2.1	5.7	2.7	2.6	1.3	.15	.10
CFSM	.19	.74	2.61	.66	3.12	1.81	.58	.64	1.30	.32	.04	.03
IN.	.22	.82	3.01	.76	3.36	2.08	.65	.74	1.45	.37	.04	.03

CAL YR 1967: TOTAL — MEAN — MAX — MIN — CFSM — IN —
WAT YR 1968: TOTAL 13,143.10 MEAN 35.9 MAX 1,500 MIN .10 CFSM .99 IN 13.54

PEAK DISCHARGE (BASE, 400 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-21	unknown	7.85	1,260	03-26	2230	7.45	755
02-01	2200	8.46	2,360	05-28	0630	7.04	470

4-1645. North Branch Clinton River near Mount Clemens, Mich.

Location.--Lat 42°37'45", long 82°53'25", in SW¼ sec. 35, T.3 N., R.13 E., on left bank 30 ft upstream from bridge on State Highway 59, 2 miles north of Mount Clemens, and 3.6 miles upstream from mouth.

Drainage area.--199 sq mi.

Records available.--May 1947 to September 1968.

Gage.--Digital water-stage recorder. Concrete control since September 1961. Datum of gage is 576.38 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Nov. 15, 1949, wire-weight gage, and Nov. 15, 1949, to Nov. 13, 1967, graphic water-stage recorder at same site and datum.

Average discharge.--21 years, 112 cfs.

Extremes.--Maximum discharge during year, 6,700 cfs Feb. 2 (gage height, 18.62 ft); minimum, 12 cfs Aug. 28 (gage height 4.22 ft).
1947-68: Maximum discharge, 6,700 cfs Feb. 2, 1968 (gage height, 18.62 ft); minimum, 0.2 cfs Sept. 13, 14, 1954, July 30, 1965; minimum gage height, 3.12 ft Sept. 13, 14, 1954.
Flood of April 5 or 6, 1947, reached a stage of 20.0 ft, from flood mark.

Remarks.--Records good. Some regulation at times by mill above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	58	56	89	1,220	37	250	67	220	330	27	17
2	18	222	49	65	4,580	37	210	60	150	237	35	14
3	20	391	82	70	4,410	35	180	55	120	128	35	29
4	17	433	156	70	1,720	31	150	54	94	96	27	31
5	15	447	107	59	943	40	430	55	74	81	24	28
6	14	354	101	51	622	55	380	53	66	84	24	27
7	14	183	146	50	443	68	210	48	73	96	31	30
8	14	116	226	46	366	74	180	44	74	68	69	25
9	20	96	231	43	292	86	160	44	67	60	71	21
10	42	84	183	43	206	150	130	46	61	200	51	20
11	44	80	390	44	133	197	110	45	59	407	44	22
12	31	128	656	44	130	198	100	43	65	323	35	27
13	25	230	873	44	101	144	90	43	66	121	29	28
14	22	186	660	44	77	90	90	43	61	85	26	27
15	24	132	326	43	70	94	130	45	54	68	23	24
16	33	103	150	45	65	282	200	52	51	58	22	22
17	101	93	119	46	61	556	130	57	50	129	49	19
18	282	90	118	51	53	535	100	59	47	146	28	18
19	311	105	270	57	48	387	100	51	44	82	42	18
20	170	105	330	60	47	321	94	56	43	65	52	19
21	88	84	426	63	43	372	94	65	44	54	56	21
22	63	77	3,580	66	40	405	100	71	48	46	39	21
23	53	90	2,630	69	40	335	88	78	48	37	29	23
24	47	101	908	68	38	158	150	66	47	36	24	24
25	43	90	501	60	37	169	193	53	108	37	21	27
26	41	80	272	55	36	370	123	46	1,550	37	19	38
27	41	71	209	54	36	1,340	97	172	3,100	32	17	33
28	51	60	170	75	37	1,290	80	819	1,480	30	15	26
29	86	50	136	254	38	880	69	1,120	735	30	16	23
30	77	57	112	663	------	500	66	700	394	30	15	20
31	63	------	96	1,000	------	300	------	350	------	26	17	------
TOTAL	1,887	4,396	14,269	3,491	15,932	9,536	4,484	4,560	9,093	3,259	1,012	722
MEAN	60.9	147	460	113	549	308	149	147	303	105	32.6	24.1
MAX	311	447	3,580	1,000	4,580	1,340	430	1,120	3,100	407	71	38
MIN	14	50	49	43	36	31	66	43	43	26	15	14
CFSM	.31	.74	2.31	.57	2.76	1.55	.75	.74	1.52	.53	.16	.12
IN.	.35	.82	2.67	.65	2.98	1.78	.84	.85	1.70	.61	.19	.13

CAL YR 1967	TOTAL 68,697.6	MEAN 188	MAX 3,580	MIN 9.0	CFSM .95	IN 12.84
WTR YR 1968	TOTAL 72,641	MEAN 198	MAX 4,580	MIN 14	CFSM 1.00	IN 13.58

PEAK DISCHARGE (BASE, 1,200 cfs)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-22	1700	17.14	4,940	03-27	1800	13.75	1,820
02-02	2000	18.62	6,700	06-27	0500	15.91	3,640

4-1646. Middle Branch Clinton River near Macomb, Mich.

Location.--Lat 42°42'03", long 82°59'44", in SE¼ sec. 2, T.3 N., R.12 E., on left bank at upstream side of bridge on Schoenherr Road, 2.0 miles west of Macomb.

Drainage area.--22.2 sq mi.

Records available.--Water years 1959-64 (annual maximum and occasional low-flow measurements), October 1964 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 630 ft (from topographic map). Nov. 4, 1958 to Sept. 21, 1964, crest-stage gage at same site and datum.

Extremes.--Maximum discharge during year, 1,400 cfs June 26 (gage height, 12.17 ft); minimum, 2.7 cfs Aug. 29, 30 (gage height, 4.72 ft).
1958-68: Maximum discharge, that of June 26, 1968.
1964-68: Minimum discharge, 0.45 cfs Oct. 29, Nov. 9, 10, 1965 (gage height, 4.60 ft, caused by construction work upstream).

Remarks.--Records fair except those for the winter periods, which are poor.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	8.7	30	14	16	386	7.2	24	12	36	24	12	16
2	7.8	64	17	16	340	6.8	21	10	31	18	8.7	20
3	6.0	44	27	16	60	7.2	20	10	24	16	7.4	13
4	5.0	52	20	15	36	8.0	111	10	17	15	6.5	9.6
5	4.3	30	18	14	33	8.7	49	10	14	16	6.5	14
6	4.5	27	20	13	30	9.0	27	10	10	16	7.4	11
7	5.0	24	27	12	28	9.8	22	9.1	9.0	13	32	7.8
8	11	23	26	11	24	10	20	8.7	8.1	12	14	6.5
9	24	23	21	11	20	11	16	11	7.4	83	13	6.9
10	8.0	22	32	11	18	12	14	10	6.8	97	10	8.7
11	6.0	31	98	11	16	10	14	8.7	7.3	32	7.4	9.1
12	4.8	34	99	11	14	8.7	13	10	9.4	22	6.0	8.2
13	4.3	27	43	11	13	12	12	9.6	8.0	18	4.9	6.5
14	4.8	25	28	12	12	14	24	10	6.6	16	4.5	6.0
15	10	25	23	12	12	14	37	12	6.0	14	3.8	5.6
16	25	22	21	13	12	78	21	15	5.6	12	6.5	4.9
17	60	24	16	14	11	37	16	13	5.2	12	24	4.5
18	36	27	38	15	9.6	31	15	10	4.9	11	10	4.5
19	27	25	45	16	9.1	28	14	13	4.9	13	44	6.5
20	23	23	30	16	8.5	36	14	13	4.2	10	18	6.9
21	21	22	303	17	8.2	40	15	11	4.2	8.7	12	6.5
22	21	24	168	17	8.0	35	14	12	5.6	8.2	9.6	6.5
23	20	25	46	16	7.8	23	30	9.6	5.2	6.9	7.4	8.2
24	19	24	31	15	7.6	31	39	8.0	6.9	9.6	6.5	8.2
25	19	22	29	13	7.4	44	22	6.5	154	10	6.9	8.7
26	18	19	30	12	7.4	130	17	9.0	590	7.8	6.0	6.9
27	28	16	30	12	7.2	81	14	250	86	8.7	5.2	6.5
28	27	14	20	35	7.2	51	13	400	48	9.6	4.5	5.6
29	22	15	18	90	7.2	40	12	170	39	7.8	3.8	4.9
30	21	15	17	120	------	31	14	70	34	6.5	3.8	4.9
31	20	------	16	42	------	28	------	48	------	7.8	3.8	------
TOTAL	521.2	798	1,371	655	1,160.2	892.4	694	1,209.2	1,198.3	561.6	316.1	243.1
MEAN	16.8	26.6	44.2	21.1	40.0	28.8	23.1	39.0	39.9	18.1	10.2	8.10
MAX	60	64	303	120	386	130	111	400	590	97	44	20
MIN	4.3	14	14	11	7.2	6.8	12	6.5	4.2	6.5	3.8	4.5
CFSM	.76	1.20	1.99	.95	1.80	1.30	1.04	1.76	1.80	.82	.46	.37
IN.	.87	1.34	2.30	1.10	1.94	1.49	1.16	2.03	2.01	.94	.53	.41

CAL YR 1967: TOTAL 8,725.2 MEAN 23.9 MAX 309 MIN 4.3 CFSM 1.08 IN 14.62
WAT YR 1968: TOTAL 9,620.1 MEAN 26.3 MAX 590 MIN 3.8 CFSM 1.18 IN 16.12

PEAK DISCHARGE (BASE, 200 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-21	2000	9.98	630	03-26	1700	7.75	234
02-01	2200	10.93	915	05-28	unknown	unknown	unknown
				06-26	0200	12.17	1,400

4-1648. Middle Branch Clinton River at Macomb, Mich.

Location.--Lat 42°42'23", long 82°57'33", in SW1/4 sec.5, T.3 N., R.13 E., on left bank at downstream side of bridge on Romeo Plank Road, 0.4 miles north of Macomb.

Drainage area.--41.0 sq mi.

Records available.--Water years 1959-62 (ahnual maximum and occasional low flow measurements), October 1962 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 603.23 ft above mean sea level, datum of 1929 (levels by Corps of Engineers). Oct. 28, 1958, to Nov. 14, 1962, crest-stage gage at same site and datum.

Average discharge.--6 years, 22.3 cfs.

Extremes.--Maximum discharge during year, 1,580 cfs June 26 (gage height, 16.11 ft); minimum, 3.1 cfs Oct. 5; minimum gage height, 5.01 ft Oct. 4, 5.

1958-68: Maximum discharge, 1,580 cfs June 26, 1968; maximum gage height, 16.16 ft Mar. 12, 1962 (backwater from ice).

1962-68: Minimum discharge, 0.3 cfs July 11, 1964 (gage height, 4.68 ft), caused by unusual regulation.

Remarks.--Records fair except those for the winter period, which are poor.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
1	6.5	22	21	27	600	9.8	46	15	44	35	13	15
2	5.1	103	23	26	848	9.5	38	12	38	23	8.7	30
3	4.2	64	46	26	350	9.8	36	11	26	17	7.6	16
4	3.4	91	35	25	80	11	234	12	21	13	6.9	10
5	3.4	45	33	23	65	12	106	11	16	15	6.9	16
6	3.7	33	39	22	55	13	59	9.6	12	23	8.7	12
7	4.0	27	55	21	50	13	46	8.7	11	12	45	8.4
8	12	24	54	20	46	14	38	8.4	10	9.6	18	7.2
9	21	24	39	19	35	15	27	12	8.7	88	19	6.9
10	6.9	20	51	19	30	16	23	12	8.0	144	13	9.1
11	5.4	37	210	19	25	13	21	9.6	9.1	42	8.7	8.7
12	4.2	54	221	19	21	12	18	12	12	25	7.6	8.4
13	3.7	36	88	19	17	18	16	11	9.1	19	7.2	7.2
14	4.2	32	54	19	16	23	36	12	8.0	16	6.5	6.5
15	7.1	28	41	20	16	30	63	16	8.7	12	5.4	5.4
16	23	24	34	21	15	100	34	20	8.7	11	7.6	5.1
17	64	24	28	22	14	55	24	18	8.7	11	34	4.8
18	59	35	55	24	13	42	23	13	8.4	9.6	13	4.8
19	24	30	94	26	12	40	21	16	8.7	13	57	6.5
20	15	23	55	27	12	50	18	17	7.6	9.1	29	7.2
21	11	21	629	28	11	54	21	13	7.6	8.0	16	7.6
22	10	28	524	28	11	45	18	16	9.1	7.2	13	6.5
23	9.6	32	102	27	11	33	39	13	8.4	6.9	10	8.4
24	8.4	27	68	25	10	50	75	11	10	10	8.0	8.4
25	8.4	24	61	23	10	70	41	8.0	181	9.6	7.2	9.6
26	7.2	21	54	20	10	323	29	11	1,010	8.0	6.9	7.6
27	21	18	54	21	10	186	22	304	166	8.0	6.1	6.9
28	30	18	35	70	10	116	18	499	79	11	6.1	6.1
29	18	23	31	150	10	89	16	130	60	8.0	5.4	5.8
30	15	14	29	280	------	64	19	83	59	7.2	5.4	5.4
31	14	------	28	80	------	56	------	58	------	7.2	5.4	------
TOTAL	432.4	1,002	2,891	1,196	2,413	1,592.1	1,225	1,402.3	1,873.8	638.4	412.3	267.5
MEAN	13.9	33.4	93.3	38.6	83.2	51.4	40.8	45.2	62.5	20.6	13.3	8.92
MAX	64	103	629	280	848	323	234	499	1,010	144	57	30
MIN	3.4	14	21	19	10	9.5	16	8.0	7.6	6.9	5.4	4.8
CFSM	.34	.81	2.27	.94	2.03	1.25	1.00	1.10	1.52	.50	.32	.22
IN.	.39	.91	2.62	1.08	2.19	1.44	1.11	1.27	1.70	.58	.37	.24

CAL YR 1967: TOTAL 14,806.8 MEAN 40.6 MAX 629 MIN 1.9 CFSM .99 IN 13.43
WAT YR 1968: TOTAL 15,345.8 MEAN 41.9 MAX 1,010 MIN 3.4 CFSM 1.02 IN 13.92

PEAK DISCHARGE (BASE, 300 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-12	0500	8.45	334	04-04	0900	9.27	429
12-21	2200	14.40	1,270	05-27	2400	12.27	870
01-30	0220	12.69	about 540	06-26	0430	16.11	1,580
02-01	2300	15.57	1,490	07-09	2200	8.89	375
03-26	1800	10.69	633				

4-1655. Clinton River at Mount Clemens, Mich.

Location.—Lat 42°35'45", long 82°54'35", on left bank 20 ft downstream from bridge on Moravian Drive, a quarter of a mile downstream from North Branch, and half a mile west of Mount Clemens.

Drainage area.—734 sq mi.

Records available.—May 1934 to September 1968.

Gage.—Digital water-stage recorder. Datum of gage is 570.43 ft above mean sea level, datum of 1929. May 10, 1934, to May 7, 1935, chain gage, May 8, 1935, to Jan. 11, 1939, wire-weight gage and Jan. 12, 1939, to Aug. 10, 1964, graphic water-stage recorder, at same site and datum. Auxiliary gage is a digital water-stage recorder on right bank 2 miles downstream from base gage at same datum. Mar. 15, 1938, to Jan. 3, 1952, auxiliary wire-weight gage 1-3/4 miles downstream of base gage at same datum. Jan. 4, 1952, to Aug. 10, 1964, auxiliary graphic water-stage recorder at present site and datum.

Average discharge.—34 years, 482 cfs.

Extremes.—Maximum discharge during year, 14,600 cfs Feb. 2 (gage height, 18.26 ft); minimum not determined; minimum gage height not determined.

1934-68: Maximum discharge, 21,200 cfs Apr. 6, 1947 (gage height, 23.55 ft, from flood mark); minimum not determined; minimum gage height, 2.72 ft Nov. 29, 1963.

Remarks.—Records good except those for the winter period and those for period of no gage height record, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	197	470	254	750	3,470	312	1,010	383	1,260	1,380	462	330
2	160	1,600	282	700	10,900	311	826	399	915	1,030	272	500
3	154	1,350	740	650	9,100	290	719	363	748	779	218	330
4	155	1,710	583	580	4,020	283	2,550	367	645	645	169	320
5	150	1,210	535	540	2,620	314	2,530	418	572	511	149	470
6	152	951	547	500	2,000	333	1,570	363	558	712	200	370
7	145	696	831	470	1,670	349	1,070	351	492	573	270	310
8	147	549	979	450	1,400	351	837	268	440	488	250	280
9	654	512	883	440	1,170	396	703	332	334	620	520	260
10	277	475	845	440	901	481	611	314	293	2,530	210	320
11	225	516	2,320	440	820	521	589	283	336	1,880	180	320
12	192	720	2,630	440	750	470	528	306	419	1,100	170	310
13	180	702	2,540	440	690	409	481	286	385	660	170	273
14	192	635	1,620	440	620	416	493	303	328	521	180	252
15	220	623	1,140	440	590	437	1,010	272	368	449	210	245
16	1,030	556	880	440	550	1,670	763	600	244	551	500	227
17	1,210	545	809	450	521	1,670	582	380	238	639	2,600	239
18	2,460	610	842	460	480	1,330	513	290	244	503	700	237
19	1,050	622	1,240	529	460	1,090	499	310	154	468	580	281
20	619	545	1,150	425	450	1,070	473	320	177	360	700	246
21	457	491	2,560	390	430	1,240	428	310	209	281	500	265
22	392	494	9,010	388	400	1,360	432	300	275	251	380	254
23	353	536	6,280	410	380	1,100	548	297	198	248	350	329
24	355	507	2,760	374	370	849	1,490	286	226	695	310	316
25	367	477	1,740	404	350	1,130	756	244	1,060	390	290	383
26	376	426	1,310	356	340	2,350	549	406	9,290	276	270	317
27	504	393	1,090	327	340	3,810	450	3,400	8,980	253	260	286
28	630	364	1,010	993	343	3,320	413	6,220	4,390	411	250	261
29	548	288	942	2,050	330	2,180	371	4,610	2,610	239	250	258
30	471	277	880	3,800	------	1,510	370	2,840	1,810	214	250	260
31	443	------	833	2,870	------	1,130	------	1,840	------	215	250	------
TOTAL	14,465	19,850	50,065	22,386	46,465	32,482	24,164	27,661	38,198	19,872	12,070	9,049
MEAN	467	662	1,615	722	1,602	1,048	805	892	1,273	641	389	302
MAX	2,460	1,710	9,010	3,800	10,900	3,810	2,550	6,220	9,290	2,530	2,600	500
MIN	145	277	254	327	330	283	370	244	154	214	149	227
CFSM	.64	.90	2.20	.98	2.18	1.43	1.10	1.22	1.73	.87	.53	.41
IN.	.73	1.01	2.54	1.13	2.35	1.65	1.22	1.40	1.94	1.01	.61	.46

CAL YR 1967 TOTAL 276,342 MEAN 757 MAX 9,010 MIN 111 CFSM 1.03 IN 14.00
WTR YR 1968 TOTAL 316,727 MEAN 865 MAX 10,900 MIN 145 CFSM 1.18 IN 16.05

PEAK DISCHARGE (BASE, 3,000 cfs)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
10-18	0600	9.07	3,010	03-27	2000	10.58	4,130
12-22	1700	15.93	10,100	04-04	1800	9.62	3,390
01-30	0900	10.48	4,050	05-28	1200	12.79	6,520
02-02	2100	18.26	14,600	06-27	0100	16.28	11,000

Note.—No gage height record Aug. 5 to Sept. 12.

4-1660. River Rouge at Birmingham, Mich.

Location.--Lat 42°32'45", long 83°13'25", in NW¼ sec.36, T.2 N., R.10 E., on left bank in Birmingham, 25 ft downstream from mouth of Quarton Lake outlet and 100 ft upstream from bridge on West Maple Road.

Drainage area.--36.9 sq mi.

Records available.--June 1950 to September 1968.

Gage.--Digital water-stage recorder. Concrete control since July 27, 1962. Datum of gage is 715.94 ft above mean sea level, datum of 1929. Prior to Oct. 13, 1965, graphic water stage recorder at same site and datum.

Average discharge.--18 years, 14.9 cfs.

Extremes.--Maximum discharge during year, 1,390 cfs June 26 (gage height, 8.70 ft); minimum, 2.7 cfs Oct. 5, 6, 7, (gage height 1.53 ft).
1950-68: Maximum discharge, 1,390 cfs June 26, 1968 (gage height, 8.70 ft); minimum, 0.10 cfs Aug. 8, 9, 1963; minimum gage height, 1.02 ft Oct. 12, 1961.

Remarks.--Records good. Occasional regulation by Quarton Lake above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.0	20	8.9	14	294	12	31	16	47	80	35	16
2	4.4	44	14	14	411	12	24	16	41	58	22	23
3	3.8	37	20	13	136	11	25	16	33	42	18	17
4	3.8	39	15	13	80	13	131	15	30	38	17	15
5	3.2	24	15	11	60	13	78	17	27	47	21	25
6	3.0	16	16	11	52	13	46	15	25	60	23	20
7	3.0	13	22	11	46	12	38	13	22	40	21	16
8	15	11	21	9.7	39	13	31	12	20	30	20	14
9	11	10	17	9.7	32	16	24	15	19	110	21	13
10	7.1	9.3	28	10	27	16	23	14	17	297	17	15
11	6.1	18	80	9.3	25	15	21	14	20	108	15	15
12	5.4	22	91	8.9	24	14	20	14	20	64	14	14
13	5.0	15	50	9.3	20	14	19	13	16	45	13	12
14	5.4	15	31	10	21	14	55	14	14	38	13	11
15	17	13	23	10	20	15	82	15	13	29	12	11
16	22	11	19	9.7	20	64	45	27	12	41	25	11
17	57	13	17	9.7	17	42	32	20	14	35	156	10
18	46	16	32	9.7	16	31	25	15	12	29	58	9.7
19	22	15	38	11	16	27	23	19	11	28	46	12
20	13	13	26	12	16	31	24	17	9.7	22	44	13
21	9.7	12	222	12	13	35	23	15	12	20	31	12
22	8.2	14	250	12	14	35	20	14	12	19	24	16
23	7.5	15	87	12	14	29	44	13	12	20	19	20
24	7.1	13	49	11	14	31	46	12	14	40	19	17
25	6.4	12	38	11	13	39	28	11	306	29	20	20
26	5.7	11	31	10	13	97	23	43	902	21	15	14
27	16	10	24	11	14	110	20	392	297	21	13	12
28	14	9.3	22	36	14	69	17	407	165	24	11	10
29	10	8.9	19	107	13	50	16	154	128	17	11	10
30	8.9	8.9	18	184	------	39	17	93	111	15	9.7	10
31	7.5	------	17	73	------	34	------	60	------	26	9.3	------
TOTAL	359.2	488.4	1,360.9	695.0	1,494	966	1,051	1,532	2,381.7	1,493	793.0	433.7
MEAN	11.6	16.3	43.9	22.4	51.5	31.2	35.0	49.4	79.4	48.2	25.6	14.5
MAX	57	44	250	184	411	110	131	407	902	297	156	25
MIN	3.0	8.9	8.9	8.9	13	11	16	11	9.7	15	9.3	9.7
CFSM	.31	.44	1.19	.61	1.40	.84	.95	1.34	2.15	1.31	.69	.39
IN.	.36	.49	1.37	.70	1.51	.97	1.06	1.54	2.40	1.50	.80	.44

CAL YR 1967 TOTAL 6,010.6 MEAN 16.5 MAX 250 MIN 1.8 CFSM .45 IN 6.06
WTR YR 1968 TOTAL 13,047.9 MEAN 35.7 MAX 902 MIN 3.0 CFSM .97 IN 13.15

PEAK DISCHARGE (BASE, 180 cfs)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-21	2000	4.79	478	05-27	2100	5.27	591
01-30	0200	3.68	250	06-26	0100	8.70	1,390
02-01	2200	5.39	603	07-10	0300	4.44	386
04-14	1800	3.25	192				

4-1661. River Rouge at Southfield, Mich.

Location.—Lat 42°26'52", long 83°17'52", in SW¼ sec. 32, T.1 N., R.10 E., on right bank at downstream side of bridge on Beech Road at Southfield, 4.2 miles east of Farmington.

Drainage area.—87.9 sq mi (revised).

Records available.—April 1958 to September 1968.

Gage.—Digital water-stage recorder. Datum of gage is 609.62 ft above mean sea level, datum of 1929 (city of Southfield bench mark). Prior to Sept. 30, 1958, wire-weight gage, and Oct. 1, 1958, to Apr. 21, 1965, graphic water-stage recorder at same site and datum.

Average discharge.—10 years, 45.8 cfs.

Extremes.—Maximum discharge during year, 4,900 cfs June 26 (gage height, 19.04 ft); minimum, 1.7 cfs Oct. 13 (gage height, 2.29 ft). 1958-68: Maximum discharge, that of June 26, 1968; minimum discharge, 0.1 cfs Aug. 2, 1964 (gage height, 1.15 ft).

Remarks.—Records fair except those for the winter period, which are poor.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	29	23	36	660	21	98	44	139	186	100	23
2	8.8	194	26	33	922	21	87	40	122	134	51	49
3	7.4	94	80	30	409	21	80	39	96	103	41	32
4	6.0	135	49	27	180	21	538	39	80	88	37	27
5	5.3	66	39	25	140	21	256	58	69	86	39	55
6	4.6	45	47	24	110	22	153	43	59	128	70	46
7	4.0	37	73	23	98	23	124	37	51	89	43	29
8	15	32	73	22	85	25	108	33	45	69	66	25
9	68	30	53	21	74	28	89	49	40	161	158	23
10	8.6	28	74	21	67	43	81	44	37	838	54	27
11	3.8	47	329	20	60	41	76	41	36	285	45	28
12	2.3	80	293	20	52	39	72	50	55	131	35	28
13	2.1	51	154	20	46	36	69	42	38	95	31	24
14	2.8	42	94	20	42	37	109	46	31	77	27	21
15	21	43	68	20	39	38	266	54	27	62	25	19
16	122	33	54	20	35	274	127	124	26	82	50	18
17	150	35	46	21	32	147	97	77	39	101	1,150	17
18	185	47	79	22	30	105	89	51	31	59	209	18
19	51	48	146	23	28	90	77	66	29	84	125	25
20	28	37	76	25	27	105	65	63	31	52	99	27
21	21	33	389	27	25	118	63	47	25	44	72	25
22	17	38	967	27	24	120	52	42	66	40	58	55
23	14	47	271	27	23	93	73	36	29	39	46	57
24	11	39	144	26	23	99	136	26	46	176	37	34
25	11	36	115	25	22	146	77	13	421	81	41	42
26	12	33	92	25	21	322	61	90	3,210	53	33	29
27	32	30	77	30	21	380	54	1,220	1,050	84	27	23
28	44	27	64	60	21	210	47	1,270	494	107	25	20
29	23	24	52	150	21	158	44	636	308	51	22	19
30	18	22	48	500	------	125	50	271	269	40	20	18
31	17	------	45	401	------	109	------	184	------	38	20	------
TOTAL	930.7	1,482	4,140	1,771	3,337	3,038	3,318	4,875	6,999	3,663	2,856	883
MEAN	30.0	49.4	134	57.1	115	98.0	111	157	233	118	92.1	29.4
MAX	185	194	967	500	922	380	538	1,270	3,210	838	1,150	57
MIN	2.1	22	23	20	21	21	44	13	25	38	20	17
CFSM	.34	.56	1.52	.65	1.31	1.11	1.26	1.79	2.65	1.34	1.05	.33
IN.	.39	.63	1.75	.75	1.41	1.29	1.40	2.06	2.96	1.55	1.21	.37

CAL YR 1967 TOTAL 20,008.3 MEAN 54.8 MAX 967 MIN 1.8 CFSM .62 IN 8.47
WTR YR 1968 TOTAL 37,292.7 MEAN 102 MAX 3,210 MIN 2.1 CFSM 1.16 IN 15.78

PEAK DISCHARGE (BASE 350 cfs)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-11	0600	7.73	389	04-15	0200	7.97	426
12-22	0100	11.36	1,220	05-28	0200	11.97	1,490
02-01	2300	12.13	1,300	06-26	0400	19.04	4,900
03-16	1000	7.92	392	07-10	0600	10.72	1,070
03-26	2300	9.08	594	08-09	0130	7.87	420
04-04	1200	9.87	788	08-17	0600	13.25	1,970

GPO 817-436-14

4-1662. Evans Ditch at Southfield, Mich.

Location.--Lat 42°27'28", long 83°16'03", in SE¼ sec. 28, T.1 N., R.10 E., on right bank at Southfield, 20 ft upstream from bridge on Ninemile Road, 1.6 miles upstream from mouth, and 5½ miles east of Farmington.

Drainage area.--9.49 sq mi.

Records available.--September 1958 to September 1968.

Gage.--Digital water-stage recorder and concrete control. Datum of gage is 615.07 ft above mean sea level, datum of 1929 (city of Southfield bench mark). Prior to Sept. 27, 1966, graphic water-stage recorder at same site and datum.

Average discharge.--10 years, 6.89 cfs.

Extremes.--Maximum discharge during year, 903 cfs June 25 (gage height, 12.95 ft); minimum, 0.01 cfs Oct. 3 (gage height, 5.11 ft). 1958-68: Maximum discharge, 903 cfs June 25, 1968, (gage height, 12.95 ft), from rating curve extended above 410 cfs; minimum, 0.01 cfs Oct. 3, 1967; minimum gage height, 5.08 ft. Sept. 13, 1966.

Remarks.--Records good except those for the winter period, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.5	22	2.8	4.4	207	1.3	6.5	5.0	5.5	9.0	10	9.5
2	1.3	132	8.0	4.2	149	1.2	5.5	1.7	6.5	7.0	3.1	9.0
3	.58	36	25	4.1	27	1.2	6.0	.84	5.5	5.5	2.5	3.1
4	.84	65	9.5	4.0	16	1.2	109	2.2	5.5	4.5	2.2	2.5
5	.84	9.0	6.5	3.9	11	1.2	18	10	4.5	4.5	4.1	7.0
6	.70	6.5	9.0	3.7	9.5	1.3	9.5	3.1	4.5	18	7.0	2.8
7	.58	5.5	20	3.6	9.0	1.4	8.5	1.2	4.1	4.5	2.8	2.0
8	14	4.5	20	3.4	7.5	1.6	7.0	.47	4.1	3.4	52	1.7
9	44	4.1	9.0	3.3	6.5	1.8	5.5	14	3.1	50	133	2.0
10	3.4	3.7	16	3.2	5.0	2.5	5.0	4.1	3.1	109	9.5	6.0
11	2.5	14	79	3.1	4.1	2.6	4.5	7.0	3.7	10	5.5	3.7
12	1.5	11	58	3.1	3.7	2.3	4.1	9.5	5.0	6.0	4.1	2.8
13	1.3	5.5	16	3.1	3.4	2.0	3.7	19	2.2	4.5	3.4	1.7
14	2.8	6.0	9.0	3.1	3.1	2.2	11	6.5	2.2	3.7	3.1	1.5
15	18	6.5	7.0	3.1	2.9	2.5	24	6.0	1.5	3.4	2.5	1.5
16	85	3.7	6.0	3.1	2.6	53	7.5	55	1.3	3.7	51	1.3
17	109	7.0	5.5	3.1	2.4	10	6.0	9.0	5.0	5.0	292	1.3
18	50	9.5	16	3.2	2.2	9.0	5.5	5.0	3.1	3.4	19	1.3
19	6.5	6.5	17	3.5	2.0	8.0	5.0	13	2.5	11	12	4.5
20	4.1	4.5	8.0	5.0	1.9	12	4.1	6.5	4.1	2.8	8.0	8.0
21	8.5	4.5	243	6.0	1.8	16	4.1	4.5	2.2	2.5	6.0	2.8
22	46	6.0	117	4.5	1.7	11	3.7	6.0	18	2.2	5.5	17
23	16	7.0	19	4.0	1.6	7.5	78	3.7	3.4	2.5	4.1	6.5
24	6.5	4.5	12	3.7	1.5	11	61	3.4	11	66	3.7	13
25	2.2	3.7	10	3.5	1.4	32	19	2.8	183	11	3.1	7.0
26	2.2	3.4	9.0	3.4	1.4	69	12	56	397	4.1	2.8	2.8
27	25	3.4	7.8	3.4	1.3	32	9.0	378	124	9.5	2.5	2.2
28	24	3.4	7.0	4.5	1.3	18	7.5	126	55	21	2.5	1.7
29	51	3.1	6.2	15	1.3	11	6.5	49	24	4.1	2.2	1.5
30	24	3.1	5.4	35	------	8.5	8.0	23	20	3.1	2.0	1.5
31	2.8	------	4.8	24	------	7.5	------	8.5	------	3.4	2.0	------
TOTAL	557.64	404.6	788.5	178.2	489.1	341.8	464.7	840.01	914.6	398.3	653.2	129.2
MEAN	18.0	13.5	25.4	5.75	16.9	11.0	15.5	27.1	30.5	12.8	21.4	4.31
MAX	109	132	243	35	207	69	109	378	397	109	292	17
MIN	.58	3.1	2.8	3.1	1.3	1.2	3.7	.47	1.3	2.2	2.0	1.3
CFSM	1.90	1.42	2.68	.61	1.78	1.16	1.63	2.86	3.21	1.35	2.25	.45
IN.	2.19	1.59	3.09	.70	1.92	1.34	1.82	3.29	3.58	1.56	2.60	.51

CAL YR 1967 TOTAL 4,346.09 MEAN 11.9 MAX 243 MIN .52 CFSM 1.25 IN 17.03
WTR YR 1968 TOTAL 6,169.85 MEAN 16.9 MAX 397 MIN .47 CFSM 1.78 IN 24.18

PEAK DISCHARGE (BASE, 200 cfs)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
10-17	2300	8.07	240	05-27	0400	9.65	462
12-21	2100	10.13	524	06-25	2300	12.95	903
02-01	2200	9.17	403	07-10	0100	8.61	336
04-04	0700	8.36	308	08-08	2300	10.73	602
04-23	2100	8.09	278	08-17	0100	12.18	795

4-1663. Upper River Rouge at Farmington, Mich.

Location.--Lat 42°27'52", long 83°22'11", in NW¼ sec. 27, T.1 N., R.9 E., on left bank 800 ft downstream from bridge on Shiawassee Road at Farmington.

Drainage area.--17.5 sq mi.

Records available.--March 1958 to September 1968.

Gage.--Digital water-stage recorder and concrete control. Datum of gage is 690.4 ft above mean sea level, datum of 1929. Prior to Sept. 27, 1966, graphic water-stage recorder at same site and datum.

Average discharge.--10 years, 9.41 cfs.

Extremes.--Maximum discharge during year, 1,500 cfs June 25 (gage height, 8.70 ft); minimum, 1.4 cfs Oct. 4, 5, (gage height, 2.80 ft).
1958-68: Maximum discharge, 1,500 cfs June 25, 1968 (gage height, 8.70 ft); minimum, 0.07 cfs Aug. 30, 1966, result of regulation; minimum daily, 0.32 cfs Aug. 10, 1964, Aug. 29, 1966.

Remarks.--Records good except those for the winter period, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.9	8.6	4.8	14	241	5.7	20	8.6	26	36	11	4.8
2	2.3	23	5.8	13	273	5.7	17	8.2	21	27	7.8	6.4
3	2.0	15	11	12	93	5.8	16	7.8	17	21	6.7	5.8
4	1.8	18	9.0	12	52	6.1	95	7.8	15	17	6.4	5.1
5	1.8	10	7.8	12	40	6.4	56	9.8	12	18	7.8	13
6	2.0	8.2	9.4	11	32	6.7	35	8.2	9.8	18	12	6.4
7	2.0	7.0	15	11	29	7.0	27	7.0	7.4	14	9.4	5.1
8	2.7	6.1	15	10	24	7.4	22	7.0	7.0	12	8.6	4.8
9	5.8	5.8	13	10	21	11	18	9.0	6.4	48	14	4.5
10	2.7	5.5	18	9.6	18	13	15	9.0	5.8	96	9.8	9.8
11	2.5	9.0	46	9.5	16	11	13	8.6	5.8	40	7.8	6.7
12	2.3	9.0	45	9.4	15	8.6	12	9.8	7.0	25	6.7	6.1
13	2.3	7.4	31	9.5	14	8.6	12	8.6	5.5	18	5.8	4.8
14	2.7	7.0	23	9.6	12	9.0	18	9.0	4.5	14	5.1	4.5
15	6.4	6.4	17	10	11	9.0	33	12	4.5	12	4.5	3.9
16	15	5.1	15	10	9.4	51	20	23	4.2	9.8	23	3.9
17	24	5.5	13	10	8.6	33	15	18	6.1	9.0	124	3.6
18	18	6.4	21	11	8.2	23	14	14	5.5	11	33	3.6
19	8.6	6.7	22	12	7.4	20	12	14	5.8	16	20	4.8
20	6.1	6.4	17	12	7.1	21	11	12	7.4	11	14	5.1
21	5.5	5.8	124	13	7.0	24	12	9.8	6.1	12	10	4.5
22	4.5	5.8	138	13	6.6	23	11	9.0	13	7.8	9.4	5.5
23	3.9	6.7	56	12	6.4	13	13	8.2	8.6	7.8	11	5.8
24	3.4	6.1	34	11	6.0	17	16	7.8	9.4	30	15	4.8
25	3.4	5.8	28	11	5.8	26	13	6.4	262	16	6.1	5.5
26	3.1	4.8	22	12	5.8	58	12	19	653	11	6.1	4.8
27	8.2	4.8	19	15	5.8	68	10	170	191	21	5.1	4.5
28	7.8	4.8	19	50	5.8	45	9.4	180	82	21	4.5	4.2
29	5.8	4.8	17	130	5.8	34	9.0	82	50	11	4.2	4.8
30	4.8	4.8	17	170	------	27	9.8	46	50	7.8	3.9	3.9
31	4.2	------	15	134	------	23	------	34	------	7.0	3.9	------
TOTAL	168.5	230.3	847.8	788.6	986.7	627.0	596.2	783.5	1,518.8	625.2	416.5	161.0
MEAN	5.44	7.68	27.3	25.4	34.0	20.2	19.9	25.3	50.6	20.2	13.4	5.37
MAX	24	23	138	170	273	68	95	180	653	96	124	13
MIN	1.8	4.8	4.8	9.4	5.8	5.7	9.0	6.4	4.2	7.0	3.9	3.6
CFSM	.31	.44	1.56	1.45	1.94	1.16	1.14	1.44	2.89	1.15	.77	.31
IN.	.36	.49	1.80	1.68	2.10	1.33	1.27	1.67	3.23	1.33	.89	.34

CAL YR 1967 TOTAL 3,756.01 MEAN 10.3 MAX 138 MIN .91 CFSM .59 IN 7.98
WTR YR 1968 TOTAL 7,750.3 MEAN 21.2 MAX 653 MIN 1.8 CFSM 1.21 IN 16.47

PEAK DISCHARGE (BASE 80 cfs)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-21	2200	4.82	267	05-27	2400	4.73	239
02-01	2100	5.82	498	06-25	2300	8.70	1500
03-26	2000	3.93	103	07-09	2200	4.68	231
04-04	0800	4.12	134	08-17	0300	5.24	343

4-1665. River Rouge at Detroit, Mich.

Location.--Lat 42°22'20", long 83°15'20", in SW¼ sec.27, T.1 S., R.10 E., on right bank 500 ft upstream from bridge on Plymouth Road in Detroit and 4 miles upstream from Middle River Rouge.

Drainage area.--187 sq mi (revised).

Records available.--October 1930 to September 1968. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Digital water-stage recorder. Datum of gage is 584.00 ft above mean sea level, datum of 1929. Prior to Aug. 11, 1943, chain gage and Aug. 11, 1943, to Oct. 15, 1948, wire-weight gage, at site 1 mile downstream at datum 4.6 ft lower, and Oct. 16, 1948, to Apr. 22, 1965, graphic water-stage recorder at present site and datum.

Average discharge.--38 years, 107 cfs.

Extremes.--Maximum discharge during year, 7,300 cfs June 26 (gage height, 21.40 ft); minimum, 28 cfs Sept. 18; (gage height, 3.78 ft).
1930-68: Maximum discharge, 13,000 cfs Apr. 5, 1947; maximum gage height, 23.0 ft Apr. 6, 1947, from flood mark, site and datum then in use; minimum discharge, 1.8 cfs Aug. 1, 2, 1964 (gage height, 3.00 ft).

Remarks.--Records good except those for the winter period, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	42	98	52	95	1,080	56	149	74	233	328	226	55
2	39	476	98	90	3,200	56	128	61	201	244	105	105
3	34	240	210	86	1,640	56	120	58	163	193	80	68
4	32	318	128	82	500	56	923	61	134	164	69	56
5	31	161	102	76	369	56	560	88	116	181	71	105
6	30	115	124	73	309	56	265	70	98	251	146	100
7	30	92	187	70	277	60	198	57	88	158	91	60
8	35	76	180	67	245	66	165	51	79	127	122	49
9	85	68	131	64	217	72	132	95	71	334	544	44
10	93	66	184	62	190	84	114	83	66	1,030	125	59
11	62	93	688	60	170	86	104	75	67	515	84	62
12	52	157	620	58	150	88	100	91	103	226	68	54
13	47	104	334	56	130	88	89	75	69	165	62	46
14	45	82	205	54	110	86	132	74	54	134	56	39
15	62	84	155	54	105	84	404	90	65	116	51	35
16	488	66	128	54	100	526	191	287	51	100	211	32
17	408	76	111	56	91	312	131	172	87	172	1,600	31
18	650	96	150	56	85	194	114	98	71	106	829	31
19	155	98	292	58	79	160	107	114	58	149	209	50
20	95	75	174	71	73	179	95	117	73	98	165	58
21	70	66	820	73	70	200	96	85	54	80	124	54
22	57	74	2,580	72	66	213	91	82	225	73	113	61
23	51	89	935	70	63	163	253	70	86	79	87	126
24	49	78	301	66	60	156	319	66	121	559	74	86
25	47	69	231	65	59	259	139	59	582	234	69	97
26	45	64	193	65	58	522	106	283	5,760	111	62	57
27	107	60	158	66	57	708	91	2,140	3,270	288	55	45
28	135	57	140	365	56	362	78	2,770	1,170	446	50	39
29	71	51	120	915	56	265	71	1,510	610	122	45	35
30	57	57	110	1,530	------	198	82	504	529	87	42	35
31	53	------	100	792	------	163	------	313	------	103	39	------
TOTAL	3,257	3,306	9,941	5,421	9,665	5,630	5,547	9,773	14,354	6,973	5,674	1,774
MEAN	105	110	321	175	333	182	185	315	478	225	183	59.1
MAX	650	476	2,580	1,530	3,200	708	923	2,770	5,760	1,030	1,600	126
MIN	30	51	52	54	56	56	71	51	51	73	39	31
CFSM	.56	.59	1.71	.94	1.78	.97	.99	1.69	2.56	1.20	.98	.32
IN.	.65	.66	1.98	1.08	1.92	1.12	1.10	1.94	2.85	1.39	1.13	.35

CAL YR 1967	TOTAL 46,316.3	MEAN 127	MAX 2,580	MIN 8.0	CFSM .68	IN 9.21
WTR YR 1968	TOTAL 81,315	MEAN 222	MAX 5,760	MIN 30	CFSM 1.19	IN 16.17

PEAK DISCHARGE (BASE, 1,200 cfs)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-22	0900	15.54	2,960	05-28	0700	15.72	2,950
02-02	1000	16.22	3,590	06-26	1200	21.40	7,300
04-04	1800	11.59	1,270	08-17	1900	14.12	2,140

4-1670. Middle River Rouge near Garden City, Mich.

Location.--Lat 42°20'55", long 83°18'45", in W½ sec. 6, T.2 S., R.10 E., on right bank 200 ft downstream from bridge on Inkster Road, 1.8 miles northeast of Garden City, and 6.0 miles upstream from mouth.

Drainage area.--99.9 sq mi (revised).

Records available.--October 1930 to September 1933 (published as "at Detroit"), June 1947 to September 1967. Monthly discharge only for October, November 1930, published in WSP 1307.

Gage.--Digital water-stage recorder. Datum of gage is 600.95 ft above mean sea level, datum of 1929. Nov. 21, 1930 to Sept. 30, 1933, staff gage at site 4.8 miles downstream at datum 17.48 ft lower, June 6, 1947 to Oct. 18, 1948, wire-weight gage at site 200 ft upstream at present datum, and Oct. 19, 1948, to April 22, 1965, graphic water-stage recorder at present site and datum.

Average discharge.--24 years, 64.3 cfs.

Extremes.--Maximum discharge during year, 2,330 cfs June 26 (gage height, 9.96 ft); minimum, 14 cfs Oct. 7 (gage height, 1.65 ft). 1930-33, 1947-68: Maximum discharge, that of June 26, 1968; maximum gage height, 11.55 ft May 1, 1933 (site and datum then in use); minimum discharge, 0.9 cfs Aug. 16, 1956.

Remarks.--Records fair except those for the winter period, which are poor. Occasional regulation by reservoirs above station since 1956.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	54	25	50	524	31	103	43	146	230	80	38
2	14	164	45	46	1,040	31	90	38	117	163	60	41
3	9.2	120	83	43	925	31	81	38	92	119	50	35
4	4.4	133	54	40	387	31	268	39	74	94	40	33
5	3.6	83	46	38	250	31	361	51	61	151	45	50
6	2.9	59	70	36	187	32	218	39	52	209	70	42
7	3.0	45	107	35	155	33	147	36	45	110	50	34
8	39	38	102	33	131	35	123	34	41	84	70	30
9	39	34	80	32	111	44	100	58	38	102	110	30
10	8.8	32	90	31	97	50	84	44	38	138	60	34
11	5.6	52	265	30	91	52	75	42	42	99	50	33
12	4.6	62	291	29	75	49	65	27	43	77	45	33
13	3.6	48	198	29	70	49	58	22	35	64	40	31
14	3.4	47	134	29	61	40	76	24	33	55	38	30
15	39	44	97	29	54	42	143	24	44	51	37	29
16	143	35	73	29	51	140	99	123	33	49	150	28
17	232	48	62	29	49	205	75	62	43	63	149	28
18	184	56	74	30	46	178	68	35	35	63	95	31
19	72	55	108	43	43	127	65	38	34	65	70	33
20	41	46	97	45	39	119	62	50	33	62	56	38
21	29	41	415	45	38	126	61	45	43	49	49	32
22	24	45	1,080	45	37	138	61	38	189	44	45	39
23	22	50	566	44	35	117	65	38	63	59	43	50
24	21	42	244	41	33	99	114	38	66	399	41	80
25	21	38	162	39	33	123	74	33	341	209	38	87
26	20	34	128	39	32	221	58	166	2,060	122	35	91
27	49	31	96	39	32	322	53	794	1,370	115	35	82
28	44	28	83	114	32	269	46	875	742	134	35	59
29	30	26	68	297	32	190	43	615	452	60	32	28
30	26	26	60	543	------	142	50	330	349	45	32	27
31	24	------	57	543	------	119	------	201	------	40	33	------
TOTAL	1,180.1	1,616	5,060	2,495	4,690	3,216	2,986	4,040	6,754	3,324	1,783	1,256
MEAN	38.1	53.9	163	80.5	162	104	99.5	130	225	107	57.5	41.9
MAX	232	164	1,080	543	1,040	322	361	875	2,060	399	150	91
MIN	2.9	26	25	29	32	31	43	22	33	40	32	27
CFSM	.38	.54	1.63	.81	1.62	1.04	1.00	1.30	2.25	1.07	.58	.42
IN.	.44	.60	1.88	.93	1.75	1.20	1.11	1.50	2.51	1.24	.66	.47

CAL YR 1967	TOTAL 24,905.1	MEAN 68.2	MAX 1,080	MIN 2.9	CFSM .68	IN 9.27
WTR YR 1968	TOTAL 38,400.1	MEAN 105	MAX 2,060	MIN 2.9	CFSM 1.05	IN 14.30

PEAK DISCHARGE (BASE 700 cfs)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-22	1100	9.01	1,210	05-27	2000	8.65	1,000
02-02	2200	9.00	1,310	06-26	1000	9.96	2,330

4-1680. Lower River Rouge at Inkster, Mich.

Location.--Lat 42°18'00", long 83°18'00", in S1/2 sec.19, T.2 S., R.10 E., on right bank 10 ft downstream from bridge on John Daly Road, 0.6 mile northeast of Inkster, and 4 3/4 miles upstream from mouth.

Drainage area.--83.2 sq mi (revised).

Records available.--June 1947 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 593.14 ft above mean sea level, datum of 1929. Prior to Oct. 20, 1948, wire-weight gage, and Oct. 21, 1948, to Apr. 22, 1965, graphic water-stage recorder at same site and datum.

Average discharge.--21 years, 48.7 cfs.

Extremes.--Maximum discharge during year, 3,600 cfs June 26 (gage height, 13.62 ft); minimum, 1.9 cfs Mar. 3 (gage height, 2.81 ft).
1947-68: Maximum discharge, 3,600 cfs June 26, 1968 (gage height, 13.62 ft); minimum, 0.2 cfs Sept. 13, 1955, Jan. 23, 1961.

Remarks.--Records good except those for the winter period, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.4	36	12	21	1,270	8.0	63	23	110	109	114	8.2
2	6.0	103	42	19	1,650	7.8	52	20	81	69	43	12
3	5.4	89	57	17	695	7.6	56	29	62	50	25	6.3
4	5.2	106	48	16	110	7.6	555	29	44	39	19	5.7
5	5.0	65	42	15	70	7.7	361	37	34	188	15	29
6	4.8	40	79	15	60	8.0	139	26	29	252	15	12
7	4.8	30	139	14	52	8.2	91	20	25	84	22	7.7
8	7.0	24	114	14	40	8.8	68	17	22	53	24	5.3
9	17	23	68	14	32	9.6	50	33	19	111	17	4.7
10	20	20	100	14	27	20	41	29	67	243	14	9.3
11	12	31	399	14	24	19	37	32	47	81	11	7.4
12	9.0	36	364	13	21	17	34	31	32	46	10	7.3
13	8.0	34	194	13	18	16	29	28	19	34	9.2	5.5
14	7.4	29	106	13	16	17	40	29	16	27	8.1	4.8
15	10	26	70	14	15	20	82	27	35	22	7.2	4.1
16	150	19	51	14	14	263	54	172	14	19	96	3.2
17	236	34	42	15	12	201	40	136	13	17	144	3.0
18	115	43	58	17	11	116	32	61	10	15	64	5.8
19	45	50	91	19	10	91	29	56	9.0	13	35	8.4
20	22	37	79	20	9.6	107	26	51	7.4	11	26	11
21	14	28	536	20	9.2	129	23	36	24	8.9	19	7.7
22	12	29	1,700	20	9.0	143	23	26	270	8.0	14	7.8
23	8.7	35	606	19	8.7	86	30	21	88	19	11	11
24	7.6	33	194	17	8.5	96	98	19	57	288	9.8	9.7
25	7.7	27	122	16	8.4	167	53	15	329	264	6.6	6.4
26	7.8	23	70	16	8.2	440	39	166	2,520	73	6.0	6.2
27	26	19	50	17	8.1	526	34	935	1,630	58	6.0	5.4
28	17	16	40	50	8.0	233	28	1,380	573	46	5.7	4.6
29	17	14	33	150	8.0	148	24	712	253	31	5.0	3.6
30	13	13	27	450	------	98	25	325	191	21	5.0	3.1
31	11	------	24	900	------	76	------	198	------	65	5.0	------
TOTAL	837.8	1,112	5,557	1,986	4,232.7	3,102.3	2,256	[illegible],719	6,630.4	2,364.9	811.6	226.2
MEAN	27.0	37.1	179	64.1	146	100	75.2	152	221	76.3	26.2	7.54
MAX	236	106	1,700	900	1,650	526	555	1,380	2,520	288	144	29
MIN	4.8	13	12	13	8.0	7.6	23	15	7.4	8.0	5.0	3.0
CFSM	.32	.45	2.15	.77	1.75	1.20	.90	1.83	2.66	.92	.31	.09
IN.	.37	.50	2.48	.89	1.89	1.39	1.01	2.11	2.96	1.06	.36	.10

CAL YR 1967	TOTAL 19,162.6	MEAN 52.5	MAX 1,700	MIN 1.4	CFSM .63	IN 8.57
WTR YR 1968	TOTAL 33,835.9	MEAN 92.4	MAX 2,520	MIN 3.0	CFSM 1.11	IN 15.12

PEAK DISCHARGE (BASE, 900 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-22	1300	11.81	2,230	05-28	0400	10.57	1,500
02-02	1130	11.47	1,990	06-26	1500	13.62	3,600

4-1695. Huron River at Commerce, Mich.

Location.--Lat 42°35'25", long 83°29'05", on line between NE¼ and SE¼ sec. 10, T.2 N., R.8 E., on downstream left abutment of bridge on Commerce Road, 10 ft upstream from Hayes Creek and 0.2 mile east of Commerce. Records include flow of Hayes Creek.

Drainage area.--49.6 sq mi (revised), includes that of Hayes Creek.

Records available.--March 1946 to September 1968.

Gage.--Staff gage read twice daily. Datum of gage is 910.00 ft above mean sea level, datum of 1929.

Average discharge.--22 years, 35.9 cfs.

Extremes.--Maximum discharge during year, 176 cfs July 1 (gage height, 2.70 ft); minimum, 16 cfs Oct. 2, 4; minimum gage height, 1.07 ft Oct. 2.

1946-68: Maximum discharge, 266 cfs Apr. 7, 1947 (gage height, 2.98 ft, from graph based on gage readings); maximum gage height, 3.10 ft May 12, 1948, from graph based on gage readings (backwater from debris); minimum discharge, 3.9 cfs Aug. 8, 1966; minimum gage height, 0.52 ft July 16, 1962.

Remarks.--Records good. Some regulation by dams operated for lake level control at outlets of Pontiac, Oxbow, and Union Lakes.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	28	35	73	79	24	88	40	54	154	42	39
2	17	37	35	75	106	26	89	39	54	128	39	39
3	17	39	36	72	109	27	90	39	50	117	40	38
4	16	43	33	70	110	29	108	39	48	108	40	37
5	18	43	26	67	110	29	101	38	44	103	40	40
6	18	43	26	63	103	35	94	36	42	98	32	38
7	17	43	26	63	101	35	91	37	40	88	35	36
8	19	42	34	60	99	33	82	34	32	84	37	35
9	26	43	32	59	99	37	82	27	30	109	47	33
10	25	42	40	60	99	40	76	26	24	114	42	36
11	25	45	47	58	97	41	71	25	23	88	42	35
12	25	49	53	57	96	43	62	25	24	82	39	33
13	22	43	53	56	91	54	62	23	24	77	37	32
14	30	39	55	56	79	42	63	22	23	75	32	30
15	28	39	56	58	73	42	56	22	24	69	30	29
16	35	39	55	59	69	49	52	25	24	66	30	28
17	39	38	55	57	65	52	51	24	23	62	75	28
18	46	41	59	55	61	57	49	24	21	61	67	26
19	42	39	58	54	57	55	48	24	21	62	62	27
20	39	39	58	47	54	57	45	24	19	57	63	34
21	33	40	79	43	55	57	46	24	18	53	61	38
22	32	42	98	39	50	58	45	24	20	52	60	40
23	32	42	95	38	47	72	45	21	20	49	58	42
24	32	42	93	38	47	74	43	26	21	54	57	41
25	32	43	93	37	47	58	43	31	30	49	57	42
26	30	43	93	35	44	63	42	41	112	44	56	40
27	32	42	92	37	40	68	40	61	120	42	54	37
28	30	40	91	42	36	71	40	65	152	42	53	35
29	27	38	83	48	33	75	40	64	164	40	49	32
30	25	37	81	54	------	78	40	62	170	38	45	30
31	25	------	77	54	------	82	------	59	------	37	42	------
TOTAL	852	1,223	1,847	1,684	2,156	1,563	1,884	1,071	1,471	2,302	1,463	1,050
MEAN	27.5	40.8	59.6	54.3	74.3	50.4	62.8	34.5	49.0	74.3	47.2	35.0
MAX	46	49	98	75	110	82	108	65	170	154	75	42
MIN	16	28	26	35	33	24	40	21	18	37	30	26
CFSM	.554	.823	1.20	1.09	1.50	1.02	1.27	.696	.988	1.50	.952	.706
IN.	.64	.92	1.38	1.26	1.62	1.17	1.41	.80	1.10	1.73	1.10	.79

CAL YR 1967:	TOTAL	13,658	MEAN	37.4	MAX	98	MIN	11	CFSM	.754	IN.	10.24
WTR YR 1968:	TOTAL	18,566	MEAN	50.7	MAX	170	MIN	16	CFSM	1.02	IN.	13.92

4-1700. Huron River at Milford, Mich.

Location.--Lat 42°34'45", long 83°37'35", in SE¼ sec. 9, T.2 N., R.7 E., on right bank 200 ft upstream from bridge on General Motors Road, half a mile downstream from Sherwood Creek, and half a mile west of Milford.

Drainage area.--125 sq mi.

Records available.--September 1948 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 880.00 ft above mean sea level, datum of 1929.

Average discharge.--20 years, 91.6 cfs.

Extremes.--Maximum discharge during year, 567 cfs June 28 (gage height, 8.26 ft); minimum, 48 cfs Oct. 6, 7, 8; minimum gage height, 4.80 ft June 14.
1948-68: Maximum discharge, 645 cfs Apr. 5, 1950; maximum gage height, 8.26 ft June 28, 1968; minimum daily discharge, 7.2 cfs Sept. 18, 1963.

Remarks.--Records good. Flow below about 300 cfs regulated by powerplant 1½ miles above station prior to May 20, 1957; occasional regulation for lake level control since.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	60	112	86	136	240	92	165	95	158	448	130	94
2	57	142	85	149	323	87	164	92	136	401	119	113
3	55	147	94	143	353	83	164	86	121	363	105	102
4	53	156	90	140	340	83	205	83	113	328	105	95
5	50	154	86	124	302	86	239	85	108	307	111	97
6	48	141	83	135	263	85	233	82	101	288	125	96
7	48	143	92	122	244	87	212	78	98	270	122	92
8	51	141	95	116	227	90	190	76	96	251	140	85
9	62	125	91	115	212	103	181	77	85	251	218	80
10	62	120	94	113	199	107	172	76	81	310	227	86
11	61	128	123	112	192	105	161	72	85	321	181	85
12	60	124	150	108	183	105	152	72	78	297	147	84
13	62	115	152	107	178	103	138	70	62	270	125	79
14	64	108	137	110	175	102	134	63	61	246	108	75
15	72	108	124	113	169	103	149	63	63	227	91	72
16	116	111	120	112	162	132	146	71	62	211	94	69
17	142	105	117	113	148	140	135	73	65	201	191	65
18	163	111	119	111	143	138	127	71	62	190	221	63
19	159	115	123	113	134	138	125	77	60	186	218	65
20	146	103	121	111	127	143	120	78	60	179	194	70
21	129	99	163	107	119	149	119	74	66	175	174	68
22	125	100	216	103	116	149	118	73	78	165	162	72
23	116	102	236	98	111	147	112	78	73	157	155	80
24	119	101	214	92	106	144	104	82	76	168	147	91
25	117	99	195	96	105	146	103	71	158	162	144	99
26	107	94	187	92	110	166	104	76	430	156	135	98
27	119	92	181	87	107	178	101	152	530	151	124	93
28	130	88	177	106	98	177	99	210	557	149	108	86
29	114	87	169	146	94	177	96	228	525	142	103	80
30	101	87	165	190	------	177	96	214	487	131	100	75
31	101	------	158	190	------	173	------	191	------	129	90	------
Total	2,869	3,458	4,243	3,710	5,280	3,895	4,364	2,989	4,735	7,230	4,414	2,509
MEAN	92.5	115	137	120	182	126	145	96.4	158	233	142	83.6
MAX	163	156	236	190	353	178	239	228	557	448	227	113
MIN	48	87	83	87	94	83	96	63	60	129	90	63
CFSM	.740	.920	1.10	.960	1.46	1.01	1.16	.771	1.26	1.86	1.14	.669
IN.	.85	1.03	1.26	1.10	1.57	1.16	1.30	.89	1.41	2.15	1.31	.75

CAL YR 1967:	TOTAL	33,975	MEAN	93.1	MAX	236	MIN	32	CFSM	.745	IN.	10.11
WTR YR 1968:	TOTAL	49,696	MEAN	136	MAX	557	MIN	48	CFSM	1.09	IN.	14.79

4-1705. Huron River near New Hudson, Mich.

Location.--Lat 42°30'45", long 83°40'35", in NE¼ sec. 1, T.1 N., R.6 E., on right bank 150 ft downstream from Kent Lake Dam, 2 miles upstream from Woodruff Creek, and 3 miles west of New Hudson.

Drainage area.--143 sq mi.

Records available.--August 1948 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 868.00 ft above mean sea level, datum of 1929.

Average discharge.--20 years, 104 cfs.

Extremes.--Maximum discharge during year, 561 cfs June 29(gage height, 4.41 ft); minimum daily, 48 cfs Apr. 14.
1948-68: Maximum discharge, 1,080 cfs Dec. 29, 1950 (gage height, 5.05 ft), from rating curve extended above 600 cfs by logarithmic plotting; minimum, 2.6 cfs May 27, 1963 (gage height, 0.53 ft).

Remarks.--Records fair. Occasional regulation by Kent Lake.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	71	180	130	159	189	135	173	95	190	459	136	118
2	68	177	128	152	206	135	165	95	180	365	128	137
3	69	176	140	150	139	134	160	95	170	310	118	137
4	67	176	148	147	193	130	122	90	150	274	113	135
5	65	180	135	146	226	125	58	90	130	250	121	134
6	62	180	124	139	232	124	100	85	119	238	142	128
7	57	180	123	134	227	123	100	85	121	219	135	122
8	57	175	123	131	218	121	100	83	117	207	137	117
9	67	171	123	127	212	116	90	85	111	209	184	116
10	69	187	122	123	211	116	70	85	106	251	200	124
11	68	188	122	119	214	116	50	85	103	249	189	123
12	65	175	125	118	202	116	50	85	106	243	166	118
13	64	166	137	117	195	117	50	85	90	233	143	115
14	69	200	141	117	191	117	48	85	85	218	129	111
15	79	170	139	118	185	117	50	85	80	200	113	109
16	109	180	136	117	205	117	60	85	80	197	109	105
17	125	170	134	117	212	121	80	90	76	191	147	99
18	135	170	133	117	206	129	70	90	76	181	172	99
19	134	200	133	117	197	137	80	95	76	185	182	100
20	130	170	134	117	178	147	85	95	76	169	183	104
21	120	170	142	117	194	157	90	90	76	155	188	106
22	110	150	163	117	185	161	90	85	80	152	173	107
23	130	120	184	115	166	169	90	80	90	143	164	113
24	148	100	201	113	148	170	92	80	110	155	155	119
25	133	113	199	113	135	170	95	75	200	157	142	125
26	134	115	195	112	135	172	100	90	292	146	142	123
27	140	140	188	112	135	178	100	140	399	145	141	121
28	150	158	179	112	136	179	100	172	501	146	133	119
29	160	148	172	115	135	182	100	180	549	140	119	113
30	160	136	167	140	------	179	100	200	533	128	119	109
31	170	------	164	157	------	177	------	190	------	125	121	------
TOTAL	3.185	4.921	4.584	3.905	5.407	4.387	2.718	3.150	5.072	6.440	4.544	3.506
MEAN	103	164	148	126	186	142	90.6	102	169	208	147	117
MAX	170	200	201	159	232	182	173	200	549	459	200	137
MIN	57	100	122	112	135	116	48	75	75	125	109	99
CFSM	.720	1.15	1.03	.881	1.30	.993	.634	.713	1.18	1.45	1.03	.818
IN.	.83	1.28	1.19	1.02	1.41	1.14	.71	.82	1.32	1.67	1.18	.91

CAL YR 1967: TOTAL 37,897 MEAN 104 MAX 208 MIN 30 CFSM .727 IN. 9.86
WTR YR 1968: TOTAL 51,819 MEAN 142 MAX 549 MIN 48 CFSM .993 IN. 13.48

4-1715. Ore Creek near Brighton, Mich.

Location.--Lat 42°29'40", long 83°48'05", in NW¼ sec. 12, T.1 N., R.5 E., on downstream side of bridge on Hamburg Road, half a mile upstream from Ore Lake and 2½ miles southwest of Brighton.

Drainage area.--31 sq mi, approximately.

Records available.--March 1951 to September 1968 (discontinued).

Gage.--Wire-weight gage read twice daily. Datum of gage is 850.56 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources.

Average discharge.--17 years, 22.0 cfs.

Extremes.--Maximum discharge during year, 148 cfs July 1 (gage height 16.61 ft); minimum observed, 5.6 cfs Jan 27 (gage height, 13.93 ft).
1951-68: Maximum discharge, 193 cfs May 13, 1956; maximum gage height, 16.61 ft July 1, 1968; minimum discharge, 1.1 cfs Aug. 4, 5, 1964.

Remarks.--Records poor. Occasional regulation by lakes above station.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10	21	16	35	61	16	50	24	50	146	34	17
2	11	25	17	30	87	16	49	23	47	124	33	22
3	11	28	18	30	82	16	46	23	46	110	35	20
4	11	28	18	25	82	16	61	23	42	95	40	16
5	11	27	18	25	88	16	55	23	35	86	40	18
6	11	27	18	24	100	17	53	21	32	74	52	16
7	10	26	19	20	96	17	51	20	32	69	40	15
8	11	26	20	17	86	16	49	19	31	66	56	15
9	13	25	21	16	81	21	45	20	31	64	56	16
10	14	25	23	15	72	18	43	19	32	60	51	20
11	13	25	28	15	63	19	40	19	31	60	47	24
12	12	25	32	15	55	24	39	20	32	58	44	22
13	13	25	35	13	49	24	36	19	30	54	43	20
14	13	24	35	11	37	21	33	18	30	48	40	20
15	15	24	35	9.8	33	23	33	20	30	44	40	19
16	22	24	35	10	33	23	32	24	32	37	42	18
17	29	23	35	10	28	24	31	22	34	38	44	17
18	36	23	35	12	26	26	30	21	34	34	40	14
19	32	24	33	13	23	29	31	20	34	30	40	18
20	26	24	33	12	21	33	30	20	34	31	36	18
21	21	24	40	9.8	20	36	35	20	34	32	32	18
22	20	24	45	9.8	20	38	33	20	38	32	33	18
23	20	24	45	9.8	19	39	31	20	34	26	33	20
24	20	23	45	10	18	40	27	25	38	42	33	21
25	20	22	45	10	19	41	27	35	58	37	32	22
26	20	20	45	9.5	18	46	28	50	132	32	24	22
27	20	17	40	8.8	17	47	26	58	126	36	23	16
28	20	16	40	18	19	50	28	65	122	34	22	17
29	20	16	41	25	18	52	25	61	125	30	21	15
30	20	16	40	35	------	52	23	57	146	29	18	14
31	20	------	35	36	------	51	------	55	------	27	18	------
TOTAL	545	701	985	539.5	1,371	907	1,120	884	1,552	1,685	1,142	548
MEAN	17.6	23.4	31.8	17.4	47.3	29.3	37.3	28.5	51.7	54.4	36.8	18.3
MAX	36	28	45	36	100	52	61	65	146	146	56	24
MIN	10	16	16	8.8	17	16	23	18	30	26	18	14
CFSM	.568	.755	1.03	.561	1.53	.945	1.20	.919	1.67	1.75	1.19	.590
IN.	.65	.84	1.18	.65	1.64	1.09	1.34	1.06	1.86	2.02	1.37	.66

CAL YR 1967: TOTAL 8,929.5 MEAN 24.5 MAX 73 MIN 3.2 CFSM .790 IN. 10.71
WTR YR 1968: TOTAL 11,979.5 MEAN 32.7 MAX 146 MIN 8.8 CFSM 1.05 IN. 14.37

4-1720. Huron River near Hamburg, Mich.

Location.--Lat 42°27'55", Long 83°48'00", in sec. 24, T.1 N., R.5 E., on right bank at downstream side of bridge on Hamburg Road, 1.1 miles north of Hamburg and 3 miles upstream from Strawberry Lake.

Drainage area.--299 sq mi.

Records available.--October 1951 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 850.00 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Aug. 12, 1953, staff gage at same site and datum.

Average discharge.--17 years, 191 cfs.

Extremes.--Maximum discharge during year, 1,330 cfs June 30 (gage height, 8.46 ft); minimum, 82 cfs Oct. 8 (gage height, 3.69 ft). 1951-68: Maximum discharge, 1,560 cfs May 15, 1956; maximum gage height, 8.46 ft June 30, 1968; minimum discharge, 32 cfs July 2, 3, 1965; minimum gage height, 3.16 ft Aug. 1-3, 1964.

Remarks.--Records good except those for the winter period, which are fair. Occasional regulation by Kent Lake 11 miles above station.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	103	268	194	300	453	220	468	208	569	1,290	300	201
2	108	286	187	300	602	210	448	199	546	1,180	292	212
3	107	294	192	300	745	210	429	196	500	1,050	283	223
4	106	302	199	300	865	210	446	192	439	924	270	228
5	101	304	210	250	847	216	453	192	381	825	261	230
6	96	302	207	250	816	230	415	190	327	739	283	228
7	87	304	207	250	780	230	392	181	288	657	298	221
8	85	296	210	250	719	230	367	174	261	586	304	210
9	91	284	214	200	654	231	354	171	239	530	333	203
10	96	271	216	200	543	244	356	169	216	502	365	208
11	98	275	235	200	500	250	327	169	196	505	392	221
12	100	290	261	200	450	252	271	174	189	528	399	225
13	97	290	275	200	450	253	239	172	180	530	381	219
14	98	281	283	200	400	244	217	171	162	510	348	212
15	104	275	290	200	380	243	221	171	148	482	311	203
16	142	268	284	200	350	262	216	178	144	446	281	196
17	190	268	277	200	350	286	210	185	142	417	275	185
18	235	286	271	200	350	302	210	181	140	408	284	180
19	252	286	271	200	350	317	216	185	136	408	302	176
20	250	271	266	200	300	333	228	190	130	392	313	185
21	237	271	286	200	300	348	244	189	125	374	315	196
22	217	266	331	200	300	358	250	180	155	350	315	198
23	201	257	363	200	300	374	255	171	171	325	309	205
24	196	232	410	200	300	376	257	162	183	323	298	214
25	210	196	420	200	250	376	250	157	248	325	286	230
26	205	185	430	200	250	385	244	157	498	321	266	234
27	208	180	430	200	220	404	241	252	730	321	253	232
28	225	189	420	250	220	429	230	341	989	344	243	223
29	230	205	400	288	220	456	225	415	1,200	339	232	212
30	243	205	350	317	------	470	219	508	1,310	325	216	203
31	255	------	350	354	------	475	------	567	------	307	208	------
TOTAL	4,973	7,887	8,939	7,209	13,264	9,424	8,898	6,747	10,942	16,563	9,216	6,313
MEAN	160	263	288	233	457	304	297	218	365	534	297	210
MAX	255	304	430	354	865	475	468	567	1,310	1,290	399	234
MIN	85	180	187	200	220	210	210	157	125	307	208	176
CFSM	.535	.880	.963	.779	1.53	1.02	.993	.729	1.22	1.79	.993	.702
IN.	.62	.98	1.11	.90	1.65	1.17	1.11	.84	1.36	2.06	1.15	.79

CAL YR	1967:	TOTAL	72,519	MEAN	199	MAX	498	MIN	54	CFSM	.666	IN. 9.02
WTR YR	1968:	TOTAL	110,375	MEAN	302	MAX	1,310	MIN	85	CFSM	1.01	IN. 13.73

4-1725. Portage River near Pinckney, Mich.

Location.--Lat 42°25'40", long 83°57'35", in SW¼ sec. 34, T.1 N., R.4 E., on right upstream abutment of bridge on Tiplady Road, 2 miles upstream from Little Portage Lake and 2¼ miles southwest of Pinckney.

Drainage area.--79 sq mi, approximately

Records available.--November 1944 to September 1968. Prior to October 1963, published as Portage Creek near Pinckney.

Gage.--Staff gage read once daily. Datum of gage is 860.38 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources).

Average discharge.--24 years, 47.5 cfs.

Extremes.--Maximum discharge year, 265 cfs July 6 (gage height, 4.60 ft); minimum, 2.2 cfs Oct. 2, 3; minimum gage height, 0.90 ft Oct. 3, 4.
1944-68: Maximum discharge, 529 cfs Apr. 9, 10, 1947 (gage height, 5.72 ft); minimum, 0.48 cfs Sept. 11, 15, 1967; minimum gage height, 0.56 ft Oct. 5, 1946.

Remarks.--Records fair. Regulation by Hiland Lake 2½ miles above station.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.0	28	30	65	71	52	84	47	98	232	84	40
2	2.2	35	29	67	85	51	84	48	100	236	81	40
3	2.2	35	30	64	89	45	83	49	99	261	79	37
4	2.3	39	32	62	100	42	95	48	97	254	75	36
5	2.7	40	31	60	104	41	89	70	95	248	74	36
6	3.1	38	31	60	110	39	92	94	93	263	74	34
7	3.4	37	33	55	116	37	93	101	89	250	72	18
8	5.0	37	34	55	120	37	94	44	86	231	70	20
9	6.3	37	34	53	120	42	97	46	85	222	80	20
10	6.6	36	40	50	130	42	95	40	82	214	76	25
11	7.0	38	44	50	130	42	93	38	79	196	75	27
12	7.2	40	51	48	130	44	91	38	83	180	72	24
13	6.3	40	52	48	120	46	90	36	78	169	71	22
14	5.7	40	52	50	114	47	90	36	71	150	70	18
15	7.0	40	53	51	110	46	94	36	61	139	68	20
16	8.9	38	53	50	107	53	89	43	55	130	68	19
17	11	39	54	50	110	55	87	42	36	116	83	18
18	12	38	54	47	100	55	87	40	37	100	75	18
19	12	38	54	46	90	57	86	40	37	101	72	20
20	13	38	54	47	89	60	82	39	35	67	70	28
21	18	37	60	35	85	63	85	37	34	80	68	26
22	25	37	69	30	80	64	89	36	36	89	68	25
23	28	36	68	29	81	65	81	35	40	81	65	30
24	25	36	70	28	75	70	81	34	48	88	62	32
25	24	36	80	27	70	70	80	32	52	90	60	34
26	24	36	80	26	70	73	75	50	151	87	60	31
27	28	36	80	25	59	75	73	75	154	85	50	31
28	29	36	77	30	57	77	50	93	158	80	48	30
29	29	33	70	38	54	81	34	100	181	82	46	30
30	28	31	68	46	------	83	43	100	200	80	44	30
31	27	------	65	48	------	85	------	99	------	83	42	------
TOTAL	411.9	1,105	1,632	1,440	2,776	1,739	2,486	1,666	2,550	4,684	2,102	819
MEAN	13.3	36.8	52.6	46.5	95.7	56.1	82.9	53.7	85.0	151	67.8	27.3
MAX	29	40	80	67	130	85	97	101	200	263	84	40
MIN	2.2	28	29	25	54	37	34	32	34	67	42	18

CAL YR 1967: TOTAL 15,022.08 MEAN 41.2 MAX 143 MIN .48 CFSM .522 IN. 7.07
WTR YR 1968: TOTAL 23,410.9 MEAN 64.0 MAX 263 MIN 2.2 CFSM .810 IN. 11.02

4-1730. Huron River near Dexter, Mich.

Location.--Lat 42°23'10", long 83°54'40", in S½ sec.13, T.1 S., R.4 E., on right bank 20 ft downstream from highway bridge on North Territorial Road, half a mile east of Hudson Mills, 2 miles downstream from Portage Lake Outlet, and 4 miles north of Dexter.

Drainage area.--506 sq mi.

Records available.--August to December 1904 (gage height only), March 1946 to September 1968. Published as "at Dover" 1904.

Gage.--Digital water-stage recorder. Datum of gage is 837.11 ft above mean sea level, datum of 1929 (levels by Michigan Department of Conservation). August to December 1904 chain gage at site 1 mile upstream at different datum. Mar. 5, 1946, to July 30, 1953, wire-weight gage and July 31, 1953 to Nov. 22, 1967 graphic water-stage recorder at present site and datum.

Average discharge.--22 years, 347 cfs.

Extremes.--Maximum discharge during year, 2,100 cfs July 1 (gage height, 6.45 ft); minimum, 73 cfs June 14 (gage height, 2.40 ft). 1946-68: Maximum discharge, 3,120 cfs Apr. 9, 1947 (gage height, 8.17 ft, from graph based on gage readings); minimum, 38 cfs Apr. 18, 1966 (gage height, 2.21 ft).

Remarks.--Records good. Occasional regulation by lake level control operations above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	106	326	311	450	797	359	737	321	974	2,030	496	300
2	111	386	308	400	1,090	337	761	320	1,060	1,830	471	300
3	115	465	311	380	1,170	312	744	372	711	1,840	389	252
4	117	470	306	386	1,160	299	758	300	833	1,610	396	314
5	115	455	305	425	1,220	294	770	356	865	1,340	401	264
6	111	445	310	389	1,280	288	798	210	547	1,360	405	309
7	113	405	313	379	1,270	301	781	290	691	1,140	413	303
8	113	386	320	350	1,230	299	749	436	558	1,020	436	295
9	140	391	325	322	1,170	302	666	253	529	824	585	293
10	181	391	361	299	1,070	321	443	244	486	550	480	305
11	136	396	445	288	808	340	517	275	280	849	463	305
12	89	405	450	290	735	361	708	339	431	805	486	301
13	98	400	455	286	700	376	614	262	471	549	534	298
14	111	400	457	301	650	372	441	253	207	748	577	295
15	140	400	488	300	600	352	366	297	344	608	498	271
16	244	391	497	300	550	355	312	316	332	570	429	255
17	305	420	485	308	550	376	525	330	168	657	472	254
18	297	435	385	293	500	411	495	323	234	633	444	252
19	297	430	365	248	489	435	381	324	279	516	450	256
20	293	301	463	274	475	458	430	323	236	582	450	270
21	305	313	494	321	450	481	430	320	213	541	450	271
22	301	420	569	318	450	526	546	316	260	399	450	281
23	301	416	611	325	450	577	464	312	477	491	450	293
24	297	401	599	304	400	560	430	306	359	699	420	343
25	293	391	628	276	400	556	438	296	547	486	400	399
26	289	342	645	273	316	572	435	309	1,250	465	400	361
27	297	208	653	279	219	593	445	613	1,510	657	350	330
28	301	640	677	312	319	666	454	749	1,500	591	350	326
29	301	262	600	386	371	735	338	793	1,770	443	320	296
30	305	287	550	514	------	700	351	989	1,910	433	300	237
31	309	------	500	653	------	603	------	892	------	498	300	------
TOTAL	6,531	11,778	14,186	10,629	20,889	13,517	16,327	12,039	20,032	25,764	13,465	8,829
MEAN	211	393	458	343	720	436	544	388	668	831	434	294
MAX	309	640	677	653	1,280	735	798	989	1,910	2,030	585	399
MIN	89	208	305	248	219	288	312	210	168	399	300	237
CFSM	.42	.78	.90	.68	1.42	.86	1.08	.77	1.32	1.64	.86	.58
IN.	.48	.87	1.04	.78	1.54	.99	1.20	.88	1.47	1.89	.99	.65

CAL YR 1967 TOTAL 113,871 MEAN 312 MAX 951 MIN 58 CFSM .62 IN 8.37
WTR YR 1968 TOTAL 173,986 MEAN 475 MAX 2,030 MIN 89 CFSM .94 IN 12.79

4-1735. Mill Creek near Dexter, Mich.

Location.--Lat 42°18'00", long 83°53'55", in SE¼ sec. 18, T.2 S., R.5 E., on left bank 12 ft downstream from bridge on Parker Road, 2½ miles south of Dexter, and 4 miles upstream from mouth.

Drainage area.--134 sq mi.

Records available.--February 1952 to September 1968.

Gage.--Digital water-stage recorder. Altitude of gage is 850 ft (from topographic map). Prior to May 23, 1958, wire-weight gage, and May 24, 1958, to Oct. 13, 1965, graphic water-stage recorder at same site and datum.

Average discharge.--16 years, 66.2 cfs.

Extremes.--Maximum discharge during year, 1,500 cfs June 26 (gage height, 12.95 ft); minimum, 17 cfs Oct. 6, 7 (gage height 5.09 ft).
1952-68: Maximum discharge, 1,500 cfs June 26, 1958 (gage height, 12.95 ft); minimum, 7.3 cfs Dec. 13, 1963; minimum gage height, 4.94 ft Dec. 13, 1963, Feb. 22, 1964.

Remarks.--Records good except those for winter period, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	41	38	60	490	34	143	45	231	438	126	38
2	20	89	41	55	925	35	122	42	188	315	102	41
3	19	87	58	53	865	36	111	40	150	212	85	40
4	18	117	58	50	550	37	414	40	120	143	76	38
5	19	96	58	48	347	39	414	58	101	123	70	43
6	18	76	74	47	256	40	256	53	86	171	72	43
7	18	65	117	45	221	41	187	47	74	133	69	40
8	19	57	129	44	187	43	151	43	69	108	124	37
9	25	53	106	43	140	61	119	46	62	113	323	36
10	23	51	109	42	120	75	100	47	56	308	196	46
11	21	60	257	40	110	70	88	44	54	196	125	54
12	20	77	322	39	95	61	78	54	64	135	94	49
13	20	69	247	38	85	58	70	49	56	109	78	43
14	20	65	176	37	75	55	71	49	48	95	67	38
15	25	61	128	36	65	55	131	62	44	87	60	36
16	77	52	101	36	58	203	103	105	43	91	82	34
17	81	56	87	36	55	199	84	131	42	82	126	33
18	102	79	95	37	50	164	74	94	41	80	105	32
19	68	80	102	38	47	149	67	86	39	92	84	38
20	48	69	91	40	44	163	60	88	36	76	70	66
21	38	62	255	40	40	169	64	70	36	66	62	56
22	33	62	570	40	37	163	59	60	113	62	58	50
23	30	67	377	40	35	114	58	56	96	58	53	55
24	29	61	233	40	34	126	65	54	227	362	49	52
25	31	59	181	40	33	155	61	46	366	516	46	68
26	30	57	140	39	32	322	58	68	1,350	311	43	56
27	40	52	110	38	32	375	54	562	1,380	191	41	49
28	63	46	95	162	33	283	48	838	1,090	145	40	43
29	50	43	80	336	33	226	45	730	818	112	38	39
30	43	43	74	510	------	186	50	528	588	93	38	37
31	38	------	67	348	------	159	------	342	------	84	37	------
TOTAL	1,108	1,952	4,576	2,497	5,094	3,896	3,405	4,577	7,668	5,107	2,639	1,330
MEAN	35.7	65.1	148	80.5	176	126	114	148	256	165	85.1	44.3
MAX	102	117	570	510	925	375	414	838	1,380	516	323	68
MIN	18	41	38	36	32	34	45	40	36	58	37	32
CFSM	.27	.49	1.10	.60	1.31	.94	.85	1.10	1.91	1.23	.64	.33
IN.	.31	.54	1.27	.69	1.41	1.08	.95	1.27	2.13	1.42	.73	.37

CAL YR 1967 TOTAL 28,134 MEAN 77.1 MAX 570 MIN 14 CFSM .58 IN 7.81
WTR YR 1968 TOTAL 43,849 MEAN 120 MAX 1,380 MIN 18 CFSM .89 IN 12.17

PEAK DISCHARGE (BASE, 500 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-22	0700	9.49	598	05-28	1200	10.56	868
01-30	0800	9.20	540	06-26	1500	12.95	1,500
02-02	1800	11.11	798	07-24	2300	9.76	526
04-04	1800	9.35	544				

4-1745. Huron River at Ann Arbor, Mich.

Location.--Lat 42°17'10", long 83°44'00", in NW1/4 sec.28, T.2 S., R.6 E., on left bank 100 ft upstream from bridge on Wall Street in Ann Arbor, three-quarters of a mile downstream from Argo Dam, and 4 miles upstream from Geddes Dam.

Drainage area.--711 sq mi.

Records available.--February 1904 to September 1968. Monthly discharge only for some periods published in WSP 1307. Published as "at Geddes" February 1904 to December 1914 and as "at Barton" January 1914 to September 1940.

Gage.--Digital water-stage recorder. Datum of gage is 744.81 ft above mean sea level, datum of 1929 (levels by Michigan Department of Natural Resources). February 1904 to December 1914 at Geddes Dam, 4 miles downstream, and January 1914 to September 1947, at Barton Dam, 3 miles upstream, flow computed from records of operation of powerplants and records of depth of flow over dam and/or flow through undersluices; October 1947 to October 1965, graphic water-stage recorder at present site and datum.

Average discharge.--64 years, 435 cfs (adjusted for diversion since 1955).

Extremes.--Maximum discharge during year, 4,610 cfs June 26 (gage height, 17.50 ft); minimum daily, 117 cfs Oct. 13; minimum gage height, 11.65 ft Oct. 14.
1914-68: Maximum daily discharge, 5,840 cfs Mar. 14, 1918; minimum daily, 4 cfs Aug. 2, Sept. 11, 1931 (plant leakage), but may be doubtful due to change in leakage.

Remarks.--Records fair. Diversion above station for Ann Arbor municipal supply had negligible effect on natural flow prior to 1955; figures of runoff adjusted since. Flow regulated by powerplants prior to May 1962, and since by occasional lake level control operations above station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	152	423	392	600	1,590	329	856	447	1,120	2,810	700	370
2	184	459	390	550	2,350	329	1,030	383	1,560	2,520	600	370
3	151	570	382	520	2,690	247	993	453	1,140	2,230	550	300
4	119	588	387	383	2,180	340	1,250	470	769	2,010	550	328
5	160	614	377	417	1,880	282	1,570	335	1,230	1,880	550	413
6	166	549	384	527	1,720	286	1,390	516	739	1,660	550	400
7	209	470	422	434	1,670	303	1,120	168	805	1,700	550	380
8	179	481	438	450	1,610	336	1,080	570	707	1,350	650	370
9	162	447	491	420	1,470	352	983	423	643	1,230	1,000	370
10	189	448	516	300	1,250	364	801	248	705	903	800	390
11	255	454	690	386	1,180	397	493	370	376	1,070	650	400
12	140	457	787	360	811	416	885	401	508	816	650	380
13	117	467	701	360	900	392	881	464	630	834	700	380
14	136	474	757	360	850	454	733	249	495	850	700	370
15	236	470	603	370	800	463	570	444	172	800	600	350
16	368	428	632	327	700	582	638	504	621	750	570	330
17	511	483	571	370	696	616	644	521	258	800	650	320
18	460	497	624	360	650	603	734	467	241	760	550	310
19	402	510	419	350	600	611	607	514	502	745	460	330
20	363	470	557	344	588	652	583	467	360	581	452	370
21	379	334	994	418	600	711	599	457	346	758	487	370
22	380	412	1,250	448	550	771	598	453	542	445	538	370
23	339	508	1,220	464	520	911	730	416	588	570	568	400
24	383	474	928	361	500	862	531	470	1,010	1,100	550	450
25	364	464	753	350	450	769	597	433	1,550	1,200	500	500
26	350	440	869	350	400	881	564	603	4,010	864	480	460
27	406	332	762	382	200	1,180	548	1,520	3,690	950	450	430
28	339	212	789	537	281	1,100	612	2,080	3,330	800	430	410
29	415	276	776	904	409	1,150	433	2,030	3,180	700	410	380
30	340	344	665	1,140	------	1,030	467	1,720	2,610	600	380	320
31	395	------	620	1,220	------	937	------	1,800	------	650	370	------
TOTAL	8,749	13,555	20,146	14,762	30,095	18,656	23,520	20,396	34,437	35,026	17,645	11,321
MEAN	282	452	650	476	1,038	602	784	658	1,148	1,130	569	377
MAX	511	614	1,250	1,220	2,690	1,180	1,570	2,080	4,010	2,810	1,000	500
MIN	117	212	377	300	200	247	433	168	172	445	370	300
+	+14.2	+13.5	+13.0	+13.7	+14.7	+14.5	+15.2	+13.9	+17.9	+18.2	+19.7	+18.2
MEAN‡	296	466	663	490	1,053	616	799	672	1,166	1,148	589	395
CFSM‡	.42	.66	.93	.69	1.48	.87	1.12	.95	1.64	1.61	.83	.56
IN.‡	.48	.73	1.08	.79	1.60	1.00	1.25	1.09	1.83	1.86	.96	.62

CAL YR 1967: TOTAL 152,402 MEAN 418 MAX 1,710 MIN 72 MEAN‡ 433 CFSM‡ .609 IN.‡ 8.26
WTR YR 1968: TOTAL 248,308 MEAN 678 MAX 4,010 MIN 117 MEAN‡ 694 CFSM‡ .976 IN.‡ 13.29

\+ Diversion, equivalent in cubic feet per second, for municipal supply; record furnished by city of Ann Arbor.
‡ Adjusted for diversion.

4-1757. River Raisin near Tecumseh, Mich.

Location.--Lat 41°56'35", long 83°56'45", in NE¼ sec. 21, T.6 S., R.4 E., on right bank 12 ft downstream from bridge on North Raisin Center Highway, 3.4 miles upstream from South Branch River Raisin, and 4.5 miles south of Tecumseh.

Drainage area.--266 sq mi.

Records available.--September 1956 to September 1968.

Gage.--Digital water-stage recorder. Datum of gage is 707.0 ft above mean sea level, datum of 1929. Prior to Nov. 15, 1962, graphic water-stage recorder at same site and datum.

Average discharge.--12 years, 153 cfs.

Extremes.--Maximum discharge during year, 2,920 cfs June 26 (gage height, 12.66 ft); minimum, 25 cfs Oct. 6 (gage height, 3.22 ft); minimum daily discharge, 48 cfs Oct. 14.
1956-68: Maximum discharge, 2,920 cfs June 26, 1968 (gage height, 12.66 ft); minimum, 6.4 cfs Aug. 26, 1964 (gage height, 2.57 ft); minimum daily, 8.3 cfs Oct. 30, 1965.

Remarks.--Records fair except those for the winter period, which are poor. Diurnal fluctuation caused by powerplant 5.5 miles above station prior to June 27, 1968.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	59	97	102	280	712	120	330	163	646	905	506	170
2	59	151	103	250	945	120	300	140	588	798	480	160
3	59	159	119	240	1,080	120	280	140	524	691	445	160
4	53	204	123	230	861	120	450	137	522	625	400	140
5	49	208	124	220	752	120	580	156	456	576	377	150
6	65	170	164	200	673	120	640	123	383	570	300	156
7	55	149	207	200	606	120	450	139	369	439	310	158
8	56	130	238	190	538	141	412	113	378	524	330	154
9	58	128	228	180	470	152	356	151	346	508	450	155
10	63	112	216	180	400	173	328	127	271	646	470	188
11	70	123	494	180	350	173	350	142	219	542	430	182
12	72	121	614	170	300	178	295	121	275	546	420	176
13	65	139	530	170	270	178	275	124	223	522	351	171
14	48	118	419	160	250	155	255	139	235	502	322	169
15	78	128	348	160	230	160	257	114	211	475	283	172
16	111	99	226	160	220	334	275	175	206	454	399	163
17	144	126	296	160	210	488	261	197	166	427	508	154
18	238	140	248	160	190	370	244	193	183	374	421	150
19	206	162	289	160	180	317	228	196	143	338	400	160
20	151	139	281	160	170	307	210	202	148	316	360	199
21	128	140	421	160	160	299	210	193	141	287	330	214
22	121	132	1,250	160	160	356	205	177	171	269	310	203
23	96	136	969	160	150	353	207	151	175	250	280	204
24	107	117	759	160	150	326	206	161	169	446	260	202
25	93	120	640	160	140	323	205	157	418	794	250	201
26	83	133	522	160	140	498	211	147	1,780	682	230	191
27	101	144	416	170	130	591	207	578	1,620	676	220	184
28	106	125	390	301	130	532	194	953	1,260	655	200	180
29	112	117	350	791	120	475	182	864	1,100	634	190	172
30	93	113	320	878	------	400	167	759	1,010	553	180	164
31	96	------	300	712	------	360	------	688	------	512	170	------
TOTAL	2,895	4,080	11,706	7,622	10,687	8,479	8,770	7,820	14,336	16,536	10,582	5,202
MEAN	93.4	136	378	246	369	274	292	252	478	533	341	173
MAX	238	208	1,250	878	1,080	591	640	953	1,780	905	508	214
MIN	48	97	102	160	120	120	167	113	141	250	170	140
CFSM	.35	.51	1.42	.92	1.39	1.03	1.10	.95	1.80	2.01	1.28	.65
IN.	.40	.57	1.64	1.07	1.49	1.19	1.23	1.09	2.00	2.31	1.48	.73

CAL YR 1967 TOTAL 69,379 MEAN 190 MAX 1,250 MIN 22 CFSM .71 IN 9.70
WTR YR 1968 TOTAL 108,715 MEAN 297 MAX 1,780 MIN 48 CFSM 1.12 IN 15.20

PEAK DISCHARGE (BASE, 700 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-22	1500	10.42	1,400	05-28	1800	9.79	1,000
01-29	2130	9.33	897	06-26	1730	12.66	2,920
02-02	1900	10.16	1,270	07-25	0930	9.26	836

4-1760. River Raisin near Adrian, Mich.

Location.--Lat 41°54'15", long 83°58'50", in NW¼ sec. 5, T.7 S., R.4 E., on right bank 10 ft downstream from bridge on Academy Road, 1.7 miles east of Adrian and 2.6 miles downstream from South Branch River Raisin.

Drainage area.-- 455 sq mi.

Records available.--October 1953 to September 1968. Records for October 1930 to August 1931, October 1932 to April 1938, published as "Raisin River" in WSP 714, 744, 759, 784, 804, 824, and 854, have been found to be unreliable and should not be used.

Gage.--Digital water-stage recorder. Datum of gage is 693.2 ft above mean sea level, datum of 1929. Prior to Nov. 16, 1963, graphic water-stage recorder at same site and datum.

Average discharge.--15 years, 277 cfs.

Extremes.--Maximum discharge during year, 3,710 cfs Feb. 3; Maximum gage height, 13.83 ft June 27; minimum discharge, 36 cfs Oct. 6 (gage height, 1.91 ft); minimum daily discharge, 48 cfs Oct. 6.
1953-68: Maximum discharge, 5,580 cfs Apr. 30, 1956 (gage height, 14.87 ft), from rating curve extended above 4,000 cfs by logarithmic plotting; minimum, 18 cfs Aug. 10, 1964 (gage height, 1.33 ft); minimum daily, 25 cfs Oct. 26, 1965.

Remarks.-- Records good except those for the winter period, which are fair. Diurnal fluctuation caused by powerplant at Tecumseh, 11 miles above station prior to June 27, 1968.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	69	167	178	500	1,880	190	524	259	1,710	1,390	516	200
2	66	271	187	460	2,780	190	477	254	1,370	1,070	493	205
3	68	366	241	430	3,560	180	437	239	1,010	824	465	201
4	69	476	252	400	2,500	180	676	234	799	671	434	187
5	56	457	262	380	1,900	180	1,110	248	710	604	408	200
6	48	414	317	360	1,570	190	1,210	244	578	618	359	199
7	78	319	465	350	1,210	200	878	224	505	472	369	194
8	67	279	548	330	934	210	671	224	491	525	394	188
9	84	244	496	310	806	230	558	275	475	543	538	187
10	74	222	439	300	639	260	489	243	429	722	561	240
11	76	223	783	290	550	270	485	217	397	747	478	240
12	86	250	1,090	280	500	280	437	221	363	661	463	230
13	78	279	1,220	280	450	270	405	220	325	573	409	223
14	72	284	1,180	280	410	270	393	234	317	528	360	203
15	126	250	895	270	380	270	404	227	292	500	331	200
16	251	226	554	270	360	423	427	381	298	478	487	194
17	324	239	454	270	330	735	424	456	276	473	630	185
18	502	319	407	270	310	750	392	470	265	427	585	183
19	483	428	414	260	290	570	369	412	254	379	475	195
20	405	400	446	260	270	498	347	379	232	358	407	248
21	260	319	624	260	250	484	338	351	231	334	365	254
22	204	285	2,110	250	240	522	331	318	232	316	335	245
23	190	272	3,130	250	230	529	330	300	248	301	309	270
24	187	262	2,020	250	220	487	331	282	254	468	288	233
25	192	253	1,470	250	210	489	320	247	431	782	270	231
26	178	231	1,120	250	200	728	322	274	1,720	889	251	219
27	172	252	875	249	200	1,060	324	1,010	3,210	769	223	211
28	193	229	750	439	200	1,120	305	1,920	2,620	689	223	204
29	196	202	670	997	200	845	290	2,920	2,110	646	210	196
30	193	191	600	1,790	------	656	282	2,680	1,730	586	208	185
31	145	------	550	2,000	------	563	------	2,110	------	521	203	------
TOTAL	5,192	8,609	24,747	13,535	23,579	13,829	14,286	18,073	23,882	18,864	12,047	6,350
MEAN	167	287	798	437	813	446	476	583	796	609	389	212
MAX	502	476	3,130	2,000	3,560	1,120	1,210	2,920	3,210	1,390	630	270
MIN	48	167	178	249	200	180	282	217	231	301	203	183
CFSM	.37	.63	1.75	.96	1.79	.98	1.05	1.28	1.75	1.34	.85	.47
IN.	.42	.70	2.02	1.11	1.93	1.13	1.17	1.48	1.95	1.54	.98	.52

CAL YR 1967 TOTAL 122,809 MEAN 336 MAX 3,130 MIN 41 CFSM .74 IN 10.04
WTR YR 1968 TOTAL 182,993 MEAN 500 MAX 3,560 MIN 48 CFSM 1.10 IN 14.96

PEAK DISCHARGE (BASE, 1,400 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-23	0900	13.82	3,380	05-29	1600	12.84	3,110
02-03	0700	13.51	3,710	06-27	0500	13.83	3,490

GPO 817-436-15

4-1764. Saline River near Saline, Mich.

Location.--Lat 42°07'50", long 83°46'35", in SE¼ sec. 13, T.4 S., R.6 E., on right bank 20 ft downstream from bridge on Maple Road, and 2.8 miles south of Saline.

Drainage area.--90.3 sq mi.

Records available.--October 1965 to September 1968.

Gage.--Water-stage recorder. Altitude of gage is 720 ft (from topographic map).

Extremes.--Maximum discharge during year, 3,990 cfs June 26 (gage height, 13.37 ft); minimum, 11 cfs early in October (gage height, 3.40 ft).

1965-68: Maximum discharge, 3,990 cfs June 26, 1968 (gage height, 13.37 ft); minimum, 5.4 cfs Oct. 9, 12, 1966; minimum gage height, 3.26 ft July 24, 1966.

Remarks.--Records good. Slight regulation for lake level control. Pumpage for irrigation diverts an indeterminate amount of water. Saline's sewage effluent, which originates as ground water, is included in flow.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11	32	21	58	782	23	95	29	223	271	85	29
2	11	68	22	56	1,320	22	85	28	185	205	75	31
3	11	62	24	54	600	22	75	27	144	167	65	31
4	11	86	26	48	378	22	90	26	94	141	60	29
5	11	62	32	39	267	22	120	33	87	131	55	34
6	15	48	40	41	201	22	150	29	71	149	52	31
7	13	40	50	40	169	23	130	27	62	113	50	29
8	11	36	60	38	140	24	110	26	53	94	80	28
9	12	33	55	37	103	25	90	33	47	85	174	28
10	13	30	130	36	84	29	80	29	44	97	89	48
11	15	34	180	34	89	31	85	31	42	80	64	39
12	16	38	300	33	72	33	80	33	43	68	53	35
13	14	36	180	32	61	35	70	30	38	59	48	31
14	13	35	130	32	55	33	60	31	35	54	44	29
15	20	30	100	31	47	30	60	33	34	50	41	28
16	30	28	80	31	41	150	62	76	33	50	176	27
17	45	35	110	31	35	240	65	76	34	48	187	26
18	60	48	80	30	33	150	60	52	33	41	112	28
19	35	51	112	30	32	90	55	52	33	39	80	30
20	28	41	81	30	31	90	50	53	30	35	63	41
21	24	37	543	30	30	112	45	42	33	33	54	34
22	21	37	1,190	30	28	114	40	45	99	31	50	31
23	20	37	467	30	27	86	35	41	59	35	45	31
24	18	36	297	30	26	85	33	38	82	363	41	30
25	19	34	221	31	25	102	31	33	238	370	38	29
26	18	31	170	32	24	367	30	56	2,960	300	36	29
27	27	29	121	35	25	461	30	700	1,410	220	34	27
28	26	26	98	50	24	236	28	1,310	744	170	33	25
29	24	24	84	500	23	163	28	662	501	140	31	25
30	22	22	73	766	------	160	31	418	368	120	30	25
31	22	------	62	351	------	120	------	297	------	100	29	------
TOTAL	636	1,186	5,139	2,646	4,772	3,122	2,003	4,396	7,859	3,859	2,074	918
MEAN	20.5	39.5	166	85.4	165	101	66.8	142	262	124	66.9	30.6
MAX	60	86	1,190	766	1,320	461	150	1,310	2,960	370	187	48
MIN	11	22	21	30	23	22	28	26	30	31	29	25
CFSM	.227	.437	1.84	.946	1.83	1.12	.740	1.63	2.90	1.37	.741	.339
IN.	.26	.49	2.12	1.09	1.97	1.29	.82	1.81	3.24	1.59	.85	.38

CAL YR 1967:	TOTAL 21,934.6	MEAN	60.1	MAX	1,190	MIN	9.6	CFSM	.666	IN.	9.03
WTR YR 1968:	TOTAL 38,610	MEAN	105	MAX	2,960	MIN	11	CFSM	1.16	IN.	15.90

PEAK DISCHARGE (BASE, 380 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-22	0100	11.60	1,650	05-28	0300	11.32	1,530
02-02	0200	11.28	1,490	06-26	0400	13.37	3,990
03-27	0300	9.73	665				

4-1765. River Raisin near Monroe, Mich.

Location.--41°57'40", long 83°31'55", on left bank 0.8 mile downstream from bridge on Ida Maybee Road, 5.0 miles downstream from Saline River, and 7.5 miles west of Monroe, Monroe County.

Drainage area.--1,034 sq mi.

Records available.--September 1937 to September 1968. Published as "Raisin River at Monroe" 1937-52 and as "River Raisin at Monroe" 1952-53.

Gage.--Digital water-stage recorder. Datum of gage is 616.26 ft above mean sea level, datum of 1929. Prior to Oct. 1, 1953, at site 9 miles downstream at datum 46.26 ft lower. Oct. 1, 1953 to Nov. 20, 1967, graphic water-stage recorder at present site and datum.

Average discharge.--31 years, 676 cfs.

Extremes.--Maximum discharge during year, 9,270 cfs Feb. 3 (gage height, 9.49 ft); minimum, 59 cfs Oct. 9; minimum gage height, 2.15 ft Oct. 7, 8, 9.

1937-68: Maximum discharge, 12,900 cfs May 19, 1945, Mar. 29, 1950; maximum gage height, 10.7 ft Feb. 1, 1949 (ice jam), site and datum then in use; minimum discharge, about 2 cfs Sept. 4, 1938, Sept. 19, 20, 1941, site then in use.

Remarks.--Records good except those for the winter period, which are fair. Diurnal fluctuation caused by powerplants above station prior to June 27, 1968. Records of suspended sediment loads for the water year 1968 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	87	318	352	1,070	4,000	350	1,390	450	4,600	4,020	950	248
2	105	670	356	1,000	5,000	340	1,120	410	3,840	3,120	860	266
3	100	748	519	950	7,000	330	987	380	2,980	2,600	800	261
4	98	1,180	789	900	7,700	330	1,580	370	2,290	1,800	750	256
5	83	1,170	945	850	6,750	329	2,010	370	1,670	1,200	700	270
6	75	1,070	1,170	800	5,300	326	2,140	380	1,180	1,300	640	270
7	69	934	1,600	750	3,960	362	2,100	380	927	1,000	640	250
8	65	772	1,570	700	3,010	367	1,890	354	748	850	800	240
9	67	628	1,520	680	2,320	387	1,600	372	634	850	1,400	230
10	87	526	1,530	640	1,710	395	1,400	410	578	871	2,000	240
11	81	479	3,170	620	1,350	402	1,200	496	538	920	1,300	260
12	85	526	3,470	600	1,060	418	1,100	425	496	1,030	861	280
13	77	610	3,310	580	936	463	1,000	390	452	1,010	756	280
14	75	676	3,160	570	850	393	950	376	420	1,000	648	270
15	98	670	2,870	560	800	396	900	358	415	900	534	250
16	226	586	2,530	560	720	676	900	778	380	800	681	250
17	435	550	2,100	550	670	1,110	800	1,340	344	700	1,220	250
18	1,190	760	1,550	550	620	1,690	750	1,310	336	700	1,300	250
19	1,040	913	1,360	540	600	1,750	700	1,210	308	700	1,180	250
20	1,020	955	1,310	530	550	1,640	680	1,020	282	600	917	250
21	864	922	2,440	520	520	1,540	670	826	272	550	725	270
22	688	812	7,240	520	500	1,530	660	712	277	500	598	290
23	474	735	6,490	520	470	1,450	660	640	286	450	512	300
24	358	681	6,570	510	450	1,350	650	568	313	470	447	310
25	304	619	6,420	500	420	1,370	640	514	712	900	395	300
26	277	562	5,290	500	400	2,330	630	502	4,120	1,800	348	290
27	277	505	3,860	500	371	3,210	600	3,090	6,970	1,700	320	280
28	264	449	2,990	800	365	3,060	560	6,000	5,720	1,500	294	270
29	277	408	1,990	3,220	419	2,890	520	6,090	4,500	1,400	260	270
30	304	391	1,500	4,320	------	2,360	480	5,480	4,510	1,300	249	260
31	304	------	1,180	4,010	------	1,830	------	5,060	------	1,100	239	------
TOTAL	9,554	20,825	81,151	29,920	58,821	35,374	31,267	41,061	51,098	37,641	23,324	7,961
MEAN	308	694	2,618	965	2,028	1,141	1,042	1,325	1,703	1,214	752	265
MAX	1,190	1,180	7,240	4,320	7,700	3,210	2,140	6,090	6,970	4,020	2,000	310
MIN	65	318	352	500	365	326	480	354	272	450	239	230
CFSM	.30	.67	2.53	.93	1.96	1.10	1.01	1.28	1.65	1.17	.73	.26
IN.	.34	.75	2.92	1.08	2.12	1.27	1.12	1.48	1.84	1.35	.84	.29

CAL YR 1967 TOTAL 300,938 MEAN .824 MAX 7,240 MIN 48 CFSM .80 IN 10.82
WTR YR 1968 TOTAL 427,997 MEAN 1,169 MAX 7,700 MIN 65 CFSM 1.13 IN 15.39

PEAK DISCHARGE (BASE, 3,500 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-11	1900	6.44	3,580	02-03	unknown	9.49	9,270
12-22	1400	8.97	7,980	05-28	1500	8.05	6,280
				06-27	1500	9.34	7,660

4-1845. Bean Creek at Powers, Ohio

Location.--Lat 41°40'40", long 84°13'50", in NE1/4 sec.24, T.9 S., R.1 E., on right bank at downstream side of bridge on U. S. Highway 20, 1 mile east of Powers, Fulton County, and 2 1/4 miles upstream from Iron Creek.

Drainage area.--206 sq mi.

Records available.--October 1940 to September 1968.

Gage.--Water-stage recorder. Datum of gage is 722.57 ft above mean sea level, datum of 1929. Prior to Jan. 18, 1941, wire-weight gage at same site and datum.

Average discharge.--28 years, 157 cfs.

Extremes.--Maximum discharge during year, 3,180 cfs Dec. 22 (gage height, 13.70 ft); minimum, 21 cfs Oct. 7, 8 (gage height, -0.13 ft).
1940-68: Maximum discharge, 4,250 cfs Apr. 29, 1956 (gage height, 13.82 ft); minimum, 5.0 cfs Aug. 9, 1964; minimum gage height, -0.35 ft Sept. 17, 18, 19, 1967.

Remarks.--Records fair except those for the winter period, which are poor.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	37	96	85	220	1,260	75	263	116	965	502	95	29
2	32	364	98	190	2,400	75	233	108	765	375	85	31
3	28	405	252	170	2,530	75	215	102	606	285	75	31
4	26	494	239	150	1,770	75	602	98	490	228	67	31
5	24	386	216	130	1,200	75	768	101	402	196	63	33
6	23	284	346	120	848	75	554	99	335	192	60	33
7	22	227	546	120	661	80	364	94	284	177	60	30
8	23	188	497	110	548	75	350	89	249	154	63	28
9	26	162	371	110	464	75	279	99	222	147	80	27
10	29	145	485	100	370	70	234	141	201	243	64	35
11	29	146	1,450	100	310	70	208	116	179	211	56	36
12	27	255	1,580	100	270	70	189	110	168	171	50	41
13	26	239	1,210	95	230	70	170	104	150	144	46	38
14	26	192	876	95	200	70	167	96	134	123	43	34
15	31	163	672	95	170	90	214	95	121	123	40	31
16	159	136	520	95	150	511	234	272	112	114	98	28
17	293	190	413	90	140	651	211	417	96	95	129	27
18	638	479	374	90	130	498	193	311	97	88	134	28
19	438	399	399	90	120	409	184	244	105	83	103	42
20	292	301	354	95	110	361	173	214	102	85	83	70
21	210	237	1,070	95	100	349	173	178	90	81	70	69
22	155	208	3,030	100	95	343	170	148	82	72	60	59
23	122	198	2,360	100	90	310	160	131	80	68	53	54
24	107	181	1,440	100	90	276	161	122	90	236	48	54
25	99	161	934	95	85	343	161	112	206	289	43	50
26	96	144	670	90	85	659	153	129	589	279	39	46
27	96	120	528	90	80	640	152	1,010	847	172	36	42
28	143	100	455	309	80	526	143	2,740	987	148	35	39
29	126	95	350	928	80	434	132	2,830	1,000	116	33	36
30	108	90	300	1,230	------	357	124	2,320	707	96	31	33
31	96	------	260	1,030	------	301	------	1,450	------	85	30	------
TOTAL	3,587	6,785	22,380	6,532	14,666	8,088	7,334	14,196	10,461	5,378	1,972	1,165
MEAN	116	226	722	211	506	261	244	458	349	173	63.6	38:8
MAX	638	494	3,030	1,230	2,530	659	768	2,830	1,000	502	134	70
MIN	22	90	85	90	80	70	124	89	80	68	30	27
CFSM	.56	1.10	3.50	1.02	2.46	1.27	1.18	2.22	1.69	.84	.31	.19
IN	.65	1.22	4.04	1.18	2.65	1.46	1.32	2.56	1.89	.97	.36	.21

CAL YR 1967: TOTAL 80,114.3 MEAN 219 MAX 3,030 MIN 9.1 CFSM 1.06 IN 14.46
WTR YR 1968: TOTAL 102,544 MEAN 280 MAX 3,030 MIN 22 CFSM 1.36 IN 18.51

PEAK DISCHARGE (BASE, 1,200 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
12-11	1800	10.17	1,680	02-03	0200	12.87	2,760
12-22	1430	13.70	3,180	05-28	2000	13.50	3,040
01-30	1230	8.64	1,260				

As the number of streams on which streamflow information in likely to be desired far exceeds the number of stream-gaging stations feasible to operate at one time, the Geological Survey collects limited streamflow data at sites other than stream-gaging stations. When limited streamflow data are collected on a systematic basis over a period of years for use in hydrologic analyses, the site at which the data are collected is called a partial-record station. Data collected at these partial-record stations are usable in low-flow analyses, depending on the type of data collected. In addition, discharge measurements are made at other sites not included in the partial-record program. These measurements are generally made in times of drought or flood to give better areal coverage to those events. Those measurements and others collected for some special reason are called measurements at miscellaneous sites.

Records collected at partial-record stations are presented in two tables. The first is a table of discharge measurements at low-flow partial-record stations and the second is a table of annual maximum stage and discharge at crest-stage stations. Discharge measurements made at miscellaneous sites for both low flow and high flow are given in a third table.

Low-flow partial-record stations

Measurements of streamflow in the area covered by this report made at low-flow partial-record stations are given in the following table. Most of these measurements were made during periods of base flow when streamflow is primarily from ground-water storage. These measurements, when correlated with the simultaneous discharge of a nearby stream where continuous records are available, will give a picture of the low-flow potentiality of the stream. The column headed "Period of record" shows the water years in which measurements were made at the same, or practically the same, site.

Discharge measurements made at low-flow partial-record stations during water year 1968

Station No.	Station Name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		Streams tributary to Lake Superior				
4-0434	Little Dead River near Ishpeming, Mich.	NE1/4 sec.17, T.48 N., R. 27W., at bridge on County Highway 573, 5 miles north of Ishpeming.	a 12	1966-68	10- 3-67	5.57
					1-30-68	6.33
					7-26-68	9.93
4-0442	Carp Creek at Ishpeming, Mich.	NW1/4 sec.9, T.47 N., R.27 W., at bridge on U. S. Highway 41A, at Ishpeming.	16.5	1961-68	11-29-67	14.4
					12-21-67	15.5
					1-30-68	12.1
					5-24-68	29.9
					7-26-68	13.8
					8-21-68	18.2
4-0444.5	Morgan Creek near Marquette, Mich.	SE1/4 SW1/4 sec.33, T.48N., R.25 W., 800 ft. upstream from mouth, 3 1/2 miles southwest of Marquette.	6.75	1965-68	10- 3-67	10.9
					1-10-68	9.04
					7-26-68	12.9
4-0445.63	Big Creek near Harvey, Mich.	SW1/4 sec.28, T.47 N., R. 24 W., 5 miles southeast of Harvey.	17.0	1962-68	11-15-67	28.0
					2- 2-68	29.7
					7-26-68	25.0
4-0445.74	Cedar Creek near Harvey, Mich.	SE1/4 NW1/4 sec.19, T.47 N., R.24 W., at road 2 3/4 miles south of Harvey.	9.17	1962-68	11-15-67	11.1
					2- 2-68	11.6
					7-26-68	11.0
		Streams tributary to Lake Michigan				
4-0492	Holland Creek near Germfask, Mich.	NE1/4 sec.21, T.45 N., R. 13 W., at bridge on State Highway M-77, 2 1/4 miles north of Germfask.	b 2	1967-68	11- 2-67	c 7.18
					11-29-67	3.05
					1-17-68	4.76
					5-14-68	3.33
					7-25-68	2.31
4-0533	Mead Creek near Germfask, Mich.	NW1/4 sec.30, T.44 N., R. 13W., at bridge on County Road 436, 5 1/2 miles southwest of Germfask.	a 31	1967-68	11- 2-67	c 38.2
					11-29-67	18.8
					1-17-68	8.91
					5-14-68	20.2
					7-25-68	9.06
4-0542	Mezik Creek near Blaney, Mich.	NE1/4 sec.1, T.43 N., R. 14 W., at bridge on County Road 436, 4.3 miles northwest of Blaney.	a 12	1967-68	11- 2-67	c 15.5
					11-29-67	4.76
					1-17-68	3.29
					5-13-68	6.00
					7-25-68	3.65
4-0544	Duck Creek near Hiawatha, Mich.	SW1/4 sec.25, T.44 N., R.15 W., immediately below tributaries 7.8 miles northeast of Hiawatha.	a 20	1967-68	11- 2-67	c 30.0
					11-28-67	24.0
					1-17-68	4.92
					5-14-68	16.0
					7-25-68	6.56

a Approximately.
b Approximately; affected by diversion.
c Not base flow.

Discharge measurements made at low-flow partial-record stations during water year 1968--Continued

Station No	Station Name	Location	Drainage area (sq mi)	Period of record	Measurements Date	Measurements Discharge (cfs)
		Streams tributary to Lake Michigan-Continued				
4-0569	Big Spring near Manistique, Mich.	S1/2 sec.25, T.42 N., R.17 W. at Palms Book State Park, 7 miles northwest of Manistique.		1950-68	11- 3-67	27.8
					3- 8-68	22.3
					5- 1-68	34.7
					7-30-68	28.9
4-0578.2	Middle Branch Escanaba River near Greenwood, Mich.	NW1/4 sec.3, T.46 N., R.28 W., 100 ft. downstream from Bell Creek, 5 miles southwest of Greenwood.	73.3	1961-68	11-29-67	42.8
					12-19-67	31.6
					1-12-68	21.6
					2-14-68	21.4
					5-21-68	95.8
					7-25-68	74.0
					8-21-68	32.0
4-0583.6	Goose Lake Outlet near Negaunee, Mich.	NW1/4 sec.24, T.47 N., R.26 W., at outlet of Goose Lake, 4 1/2 miles east of Palmer.	14.6	1962-68	10-24-67	9.17
					11-28-67	12.3
					12-18-67	9.87
					1- 9-68	8.12
					2-13-68	8.01
					5-21-68	23.8
					8- 1-68	13.6
					9- 5-68	17.1
4-0587	Little Lake Outlet at Forsyth, Mich.	NE1/4 NE1/4 sec.30, T.45 N., R.24 W., at outlet of Little Lake, 1.0 mile southwest of Forsyth.	9.72	1964-68	10- 3-67	.42
					2-12-68	3.41
					8- 2-68	3.68
4-0599.8	Stanley Creek near Iron River, Mich.	NW1/4 NE1/4 sec.33, T.43 N., R.35 W., at State Highway 73, 1 1/2 miles downstream from Stanley Lake and 2.2 miles west of Iron River.	3.28	1964-68	10- 3-67	1.20
					1- 5-68	1.05
					4-13-68	3.73
					7-15-68	4.19
4-0620.95	Dishno Creek near Champion, Mich.	NW1/4 sec.6, T.48 N., R.29 W., at bridge 1.2 miles upstream from mouth, 5 miles north of Champion.	18.8	1963-68	10- 4-67	1.67
					1-10-68	5.22
					7-24-68	30.9
4-0622.5	Spruce River near Republic, Mich.	NE1/4 sec.20, T.47 N., R.30 W., 1/2 mile upstream from mouth, 7 miles southwest of Champion.	31.0	1964-68	11-14-67	33.5
					1-11-68	12.2
					5-20-68	38.1
					7-24-68	22.4
4-0657	Hamilton Creek near Loretto,	NW1/4 sec.30, T.39 N., R.28 W., at outlet of Lake Mary, 2.0 miles south of Loretto.	a15	1964-68	10- 3-67	3.62
					1- 5-68	3.17
					7-15-68	18.6
4-0972.05	Gourdneck Creek near Vicksburg, Mich.	SW1/4 sec.1, T.4 S., R.11 W., at 23rd St., 2.0 miles north of Vicksburg.	13.1	1964-68	10- 5-67	10.8
					11- 9-67	15.8
					1- 9-68	18.9
					2-14-68	29.6
					3-13-68	22.3
					5- 8-68	15.5
					6- 4-68	11.5
					7- 2-68	15.7
					8- 9-68	20.5
					9- 6-68	11.1
*4-0973.7	Flowerfield Creek at Flowerfield, Mich.	SW1/4 sec.1, T.5 S., R.12 W., at Flowerfield Rd., at Flowerfield.	42.6	1964-68	4-30-68	19.2
4-0975.37	Perrin Lake Outlet near Sturgis, Mich.	SW1/4 sec.12, T.7 S., R.10 W., at Perrin Rd., (Banker St. Rd.), 5.0 miles north of Sturgis.	2.91	1963-68	10- 2-67	0
					4-30-68	.03
					9- 5-68	1.40
4-0986.1	Sherman Mill Creek near Sturgis, Mich.d/	SW1/4 sec.28, T.7 S., R.10 W., at Sherman Rd., 3.7 miles northwest of Sturgis.	3.62	1963-68	10- 2-67	5.33
					4-30-68	5.73
					9- 5-68	7.23
4-0986.2	Sherman Mill Creek near Centreville, Mich.e/	NW1/4 sec.32, T.7 S., R.10 W., at Shimmel Rd., 4.8 miles northwest of Sturgis.	5.31	1963-68	10- 2-67	11.4
					4-30-68	10.2
					9- 5-68	14.6
4-0986.3	Sherman Mill Creek near White Pigeon, Mich.f/	S1/2 sec.36, T.7 S., R.11 W., at Klinger Lake Rd., 5.7 miles east of White Pigeon.	9.00	1963-68	10- 2-67	14.2
					4-30-68	14.0

* Also a crest-stage station.
a Approximately.
d Published as Thompson Lake Inlet 1963.
e Published as Thompson Lake Outlet 1963.
f Published as Klinger Lake Inlet 1963.

Discharge measurements made at low-flow partial-record stations during water year 1968--Continued

Station No.	Station Name	Location	Drainage area (sq mi)	Period of record	Measurements Date	Measurements Discharge (cfs)
		Streams tributary to Lake Michigan--Continued				
4-1056.8	Augusta Creek near Hickory Corners, Mich.	SW1/4 sec.3, T.1 S., R.9 W., at AB Ave., 2.8 miles southeast of Hickory Corners.	19.6	1964-68	9-30-68	11.0
4-1059.9	Comstock Creek near Kalamazoo, Mich.	NW1/4 sec.17, T.2 S., R.10 W., at E. Main St., 4.3 miles east of Kalamazoo.	18.3	1964-68	9-30-68	5.85
4-1061.4	Portage Creek tributary near Portage, Mich.	SE1/4 sec.19, T.3 S., R.11 W., at R. Ave., 2.2 miles southwest of Portage.	2.63	1960-64, 1966-68	9-30-68	2.73
4-1067.3	Spring Brook near Richland, Mich.	SE1/4 sec.18, T.1 S., R.10 W., at CD Ave., 3.0 miles west of Richland.	22.4	1964, 1966-68	9-24-68	7.13
4-1067.5	Spring Brook near East Cooper, Mich.	NW1/4 sec.25, T.1 S., R.11 W., at Riverview Rd., 0.6 mile north of East Cooper.	31.1	1942, 1964-68	9-24-68	16.8
4-1067.7	Kalamazoo River near Cooper Center, Mich.	SE1/4 sec.15, T.1 S., R.11 W., at D Ave., 1.5 miles east of Cooper Center and 5.5 miles north of center of Kalamazoo, Mich.	1,248	1965-66, 1968	2-19-65 8- 4-65 10-18-65 7-21-66 8-30-66 5-24-68 9-24-68	1,190 365 497 429 398 1,330 936
4-1106.9	Sandstone Creek near Jackson, Mich.	SE1/4 sec.1, T.3 S., R.2 W., at O'brien Rd., 4.4 miles west of center of Jackson.	29.8	1966-68	10- 6-67 3- 6-68 5- 3-68 9- 3-68	8.83 15.2 12.6 12.0
4-1109.1	Hobart Drain near Eaton Rapids, Mich.	NW1/4 sec.10, T.1 N., R.3 W., at State Hwy. 99, 1.2 miles south of Eaton Rapids.	2.80	1965-68	10- 6-67 3- 6-68 5- 1-68 9- 3-68	.54 1.14 .04 1.16
4-1145.7	Bear Creek near Ovid, Mich.	SW1/4 sec.23, T.7 N., R.1 E., at Krause Rd., 2.5 miles southeast of Ovid.	29.5	1965-68	10- 4-67 3- 6-68 5- 1-68 9- 4-68	3.18 9.08 10.7 2.88
4-1145.9	Little Maple River near Laingsburg, Mich.	SW1/4 sec.34, T.7 N., R.1 W., at Shepardsville Rd., 5.5 miles northwest of Laingsburg.	11.4	1965-68	10- 4-67 3- 6-68 5- 1-68 9- 4-68	.97 2.90 5.62 .99
4-1158.3	Libhart Creek near Lyons, Mich.	NE1/4 sec.1, T.6 N., R.6 W., at Reeder Rd., 2.8 miles south of Lyons.	32.7	1965-68	10- 5-67 3- 6-68 4-30-68 9- 6-68	5.90 11.9 14.3 6.42
4-1158.5	Little Libhart Creek near Lyons, Mich.	NW1/4 sec.6, T.6 N., R.5 W., at Reeder Rd., 2.8 miles south of Lyons.	12.9	1965-68	10- 5-67 3- 6-68 4-29-68 9- 6-68	1.36 4.58 4.24 1.52
4-1160.4	Sessions Creek near Ionia, Mich.	NW1/4 sec.34, T.7 N., R.7 W., at Riverside Drive, 3.5 miles southwest of Ionia.	16.8	1965-68	10- 5-67 3- 6-68 4-25-68 9- 6-68	2.02 5.57 6.20 1.88
4-1221.2	Bear Creek at North Muskegon, Mich.	NW1/4 sec.8, T.10 N., R.16 W., at Russell Street, 1.0 mile northeast of North Muskegon.	24.4	1966-68	10- 3-67 1- 9-68 4-11-68 5- 8-68 7-10-68	11.3 20.2 19.3 16.9 12.6
4-1257	Bear Creek near Brethren, Mich.	NE1/4 sec.18, T.22 N., R.14 W., at Potter's Bridge, 1.5 miles northwest of Brethren.	a170	1958, 1960-68	10-23-67 1-15-68 7- 8-68	108 134 150

a Approximately.

Discharge measurements made at low-flow partial-record stations during water year 1968--Continued

Station No.	Station Name	Location	Drainage area (sq mi)	Period of record	Measurements Date	Measurements Discharge (cfs)
		Streams tributary to Lake Michigan--Continued				
4-1267	Platte River near Honor, Mich.	SE1/4 sec.12, T.26 N., R.14 W., at U.S. Highway 31, 4 miles east of Honor.	91.9	1958, 1960-68	10- 3-67	82.2
					12- 4-67	74.4
					1-16-68	73.3
					2- 8-68	79.0
					3-11-68	75.3
					4- 8-68	82.2
					5- 6-68	77.5
					6- 4-68	76.6
					7- 8-68	75.0
					8- 5-68	66.0
					9- 4-68	76.0
		Streams tributary to Lake Huron				
4-1279	Caribou Creek near DeTour Village, Mich.	SE1/4 SE1/4 sec.31, T.42 N., R.4 E., at bridge on South Road, 4.7 miles west of DeTour Village.	a 4	1967-68	10-31-67	1.10
					1-15-68	10.6
					5-15-68	3.41
					7-24-68	10.0
4-1279.4	North Fork Carp River near Fibre, Mich.	SE1/4 SW1/4 sec.19, T.43 N., R. 4 W., at bridge on Kenneth Road, 10 miles southwest of Fibre.	a25	1968	10-31-67	18.6
					1-15-68	10.9
					5-15-68	50.4
					7-24-68	11.5
4-1302	East Branch Black River near Atlanta, Mich.	NW1/4 NE1/4 sec.22, T.32 N., R.1 E., at Barber Bridge, 12.8 miles northwest of Atlanta.	a44	1966-68	11-15-67	60.8
					1- 3-68	51.3
					4- 2-68	67.7
					5- 1-68	57.1
					7- 9-68	41.4
					9- 3-68	45.4
4-1323	Hunt Creek near Lewiston, Mich.	SW1/4 sec.25, T.29 N., R. 2 E., 8 miles southeast of Lewiston.	a11	1943-68	10- 2-67	25.0
					1- 3-68	24.0
					4- 3-68	24.8
					7- 1-68	21.2
4-1358	North Branch AuSable River near Lovells, Mich.	SE1/4 sec.16, T.27 N., R. 1 W., 5 miles southeast of Lovells.	a140	1951, 1953-68	1-25-68	139
					4-26-68	187
					5-17-68	180
4-1359	Big Creek near Lovells, Mich.	SW1/4 sec.23, T.27 N., R. 1 W., 7 miles southeast of Lovells.	a180	1951-68	1-25-68	68.0
					4-26-68	104
					5-17-68	67.4
4-1437	Shiawassee River near Davisburg, Mich.	NE1/4 sec.12, T.4 N., R.7 E., at Eagle Rd., 2.0 miles northwest of Davisburg.	11.6	1966-68	3- 5-68	7.91
4-1438.3	Shiawassee River at Holly, Mich.	At corner of secs.28, 29, 32, 33, T.5 N., R.7 E., at Fish Lake Rd., at Holly.	49.2	1955,63 1966-68	3- 5-68	25.4
4-1480.2	Kearsley Creek at Ortonville, Mich.	SE1/4 sec.18, T.5 N., R.9 E., at Granger Rd., at Ortonville.	19.7	1966-68	3- 5-68	12.0
4-1480.3	Duck Creek at Ortonville, Mich.	NW1/4 sec.18, T.5 N., R.9 E., at South Street, at Ortonville.	7.23	1966-68	3- 5-68	3.96
4-1482.5	Swartz Creek near Bayport Park, Mich.	W1/2 sec.6, T.5 N., R.7 E., at Thompson Rd., 1.7 miles northeast of Bayport Park.	31.3	1966-68	3- 5-68	12.7
*4-1484	Thread Creek near Holly, Mich.	SE1/4 sec.18, T.5 N., R.8 E., at Groveland Mills, 5 1/2 miles northeast of Holly.	12.2	1955-68	11- 6-67	5.12
					2-15-68	3.85
					4-12-68	3.18
					5- 6-68	2.96
					6- 5-68	2.99

a Approximately.
* Also a crest-stage station.

Discharge measurements made at low-flow partial-record stations during water year 1968--Continued

Station No.	Station Name	Location	Drainage area (sq mi)	Period of record	Measurements Date	Measurements Discharge (cfs)
		Streams tributary to St. Clair River				
4-1593	Black River near Croswell, Mich.	SE1/4 sec.8, T.9 N., R.16 E., 3 1/2 miles south of Croswell.	376	1956-68	10- 5-67	26.9
					11- 7-67	298
					12- 5-67	102
					7-16-68	32.5
					8-13-68	21.4
					9-19-68	12.0
		Streams tributary to Lake St. Clair				
4-1607.5	Clinton River at Clarkston, Mich.	NW1/4 sec.20, T.4 N., R.9 E., at Bluegrass Drive, at Clarkston.	11.5	1966-68	3- 6-68	8.20
4-1607.6	Deer Lake Outlet at Clarkston, Mich.	NW1/4 NW1/4 sec.29, T.4 N., R. 9 E., at White Lake Rd., at Clarkston.	15.0	1966-68	3- 6-68	8.42
4-1607.95	Judah Lake Outlet near Eames, Mich.	NW1/4 sec.33, T.4 N., R.10 E., at Baldwin Rd., 1.2 miles northwest of Eames.	4.39	1966-68	3- 6-68	1.07
4-1613	Paint Creek Drain near Oxford, Mich.	NW1/4 sec.4, T.4 N., R.10 E., at Newman Rd., 2.4 miles southwest of Oxford.	18.3	1966-68	3- 6-68	6.79
4-1615.38	Sargent Creek at Rochester, Mich.	SW1/4 sec.10, T.3 N., R.11 E., at Livernois Rd., at Rochester.	4.69	1966-68	3- 6-68	.86
4-1616	West Branch Stony Creek near Lakeville, Mich.	SE1/4 sec.5, T.4 N., R.11 E., at Predmore Rd., 2 1/2 miles east of Lake Orion, and 3 miles southwest of Lakeville.	14.8	1955-68	10-18-67	5.60
*4-1617.6	West Branch Stony Creek near Washington, Mich.	SE1/4 sec.25, T.4 N., R.11 E., on Huron-Clinton Metropolitan Park Rd., 3.4 miles west of Washington.	22.5	1965-68	11- 7-67	11.4
					12-13-67	20.3
					12-21-67	c104
					3-13-68	17.3
					5- 5-68	12.9
					8-26-68	1.74
4-1617.7	Twin Lakes Outlet near Washington, Mich.	SE1/4 sec.25, T.4 N., R.11 E., on Huron-Clinton Metropolitan Park Rd., 3.2 miles west of Washington.	3.63	1965-68	11- 7-67	2.12
					3-13-68	4.38
					9-13-68	4.28
4-1617.8	Mount Vernon Drain near Washington, Mich.	SW1/4 sec.30, T.4 N., R.12 E., on Huron-Clinton Metropolitan Rd., 3.0 miles west of Washington.	1.87	1965-68	11- 7-67	.96
					3-13-68	1.86
					9-13-68	1.16
4-1618.3	Clinton River at Yates, Mich.	SE1/4 sec.13, T.3 N., R.11 E., at Avon Rd., at Yates.	299	1966-68	3- 5-68	221
		Streams tributary to Detroit River				
g4-1659.9	River Rouge tributary at Birmingham, Mich.	NE1/4 NE1/4 sec.26, T.2 N., R. 10 E., at Quarton Rd., at Birmingham.	21.5	1966-68	3- 5-68	9.07
					4-23-68	10.6
g4-1660.3	Franklin Branch at Franklin, Mich.	NW1/4 NW1/4 sec.9, T.1 N., R. 10 E., at Thirteen Mile Rd., at Franklin.	15.4	1966-68	3- 5-68	8.55
					4-23-68	11.8
g4-1660.9	Pebble Creek near Southfield, Mich.	NE1/4 sec.30, T.1 N., R.10 E., at Ten Mile Rd., 1.4 miles southwest of Southfield.	10.3	1966-68	3- 5-68	3.56
					4-23-68	5.35
g4-1662.9	Minnow Pond Drain at Quakertown, Mich.	SW1/4 sec.15, T.1 N., R.9 E., at Farmington Rd., at Quakertown.	9.18	1966-68	3- 5-68	.71
					4-23-68	3.62
g4-1666	Walled Lake Branch at Northville, Mich.	NW1/4 SW1/4 sec.35, T.1 N., R. 8 E., at Novi Rd., at Northville.	22.1	1966-68	3- 5-68	8.03
					4-23-68	14.1

* Also a crest-stage station.
c Not base flow.
g See pp. 246,247 for other measurements in River Rouge Basin.

GPO 817-430-16

Discharge measurements made at low-flow partial-record stations during water year 1968--Continued

Station No.	Station Name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		Streams tributary to Lake Erie				
4-1688	Huron River near Andersonville, Mich.	NW1/4 SE1/4 sec.3, T.3 N., R.8 E., at White Lake Rd., 2.5 miles south of Andersonville.	14.0	1966-68	3- 5-68	3.28
4-1689	Huron River near Drayton Plains, Mich.	SE1/4 sec.13, T.3 N., R.8 E., at Pontiac Lake Outlet, 4 1/2 miles southwest of Drayton Plains.	20.8	1948-52, 1966-68	3- 5-68	1.20
4-1697	Norton Creek near Milford, Mich.	NE1/4 NE1/4 sec.25, T.2 N., R.7 E., at Buno Rd., 3.0 miles southeast of Milford.	17.9	1966-68	3- 5-68	13.8
4-1699.5	Pettibone Creek at Milford, Mich.	NE1/4 NE1/4 sec.10, T.2 N., R.7 E., at Commerce Rd., at Milford.	18.0	1966-68	3- 5-68	10.6
4-1708	Davis Creek near South Lyon, Mich.	NE1/4 NE1/4 sec.18, T.1 N., R.7 E., at Pontiac Trail Rd., 2.0 miles north of South Lyon.	24.4	1966-68	3- 5-68	7.37
4-1722	Arms Creek near Hamburg, Mich.	NE1/4 sec.5, T.1 S., R.5 E., at Mast Rd., 4.4 miles southwest of Hamburg.	21.5	1967-68	10-20-67	3.43
					11-29-67	5.93
					12-29-67	10.7
					12-29-67	15.4
					2-15-68	13.6
					3-22-68	23.6
					4-12-68	15.8
					5- 8-68	8.49
					6- 6-68	14.6
					7-12-68	20.0
					8-19-68	8.30
					9- 3-68	5.68
4-1732.5	Mill Creek near Lima Center, Mich.	NE1/4 sec.34, T.2 S., R.4 E., at Guenther Rd., 2.2 miles south of Lima Center.	42.2	1967-68	10-20-67	18.7
					11-29-67	17.6
					12-20-67	30.3
					1-30-68	176
					2-27-68	14.3
					3-21-68	56.9
					4-12-68	31.2
					5-23-68	22.8
					6- 5-68	32.2
					7-16-68	28.8
					8-19-68	28.1
					9- 4-68	16.3
4-1763.9	Saline River at Saline, Mich.	SE1/4 sec.1, T.4 S., R.5 E., at Monroe St., in Saline.	75.0	1965-68	10-20-67	18.8
					12-19-67	94.3
					3-21-68	101
					5-10-68	23.1
					9- 4-68	17.6
4-1764.2	Saline River at Milan, Mich.	SW1/4 sec.1, T.5 S., R.6 E., at U. S. Highway 23 at southeast edge of Milan.	a110	1966-68	10-20-67	3.34
					12-15-67	136
					3-21-68	139
					5-10-68	156
					9- 4-68	33.2

a Approximately.

Crest-stage partial-record stations

The following table contains annual maximum discharges for crest-stage stations. A crest-stage gage is a device which will register the peak stage occurring between inspections of the gage. A stage-discharge relation for each gage is developed from discharge measurements made by indirect measurements of peak flow or by current meter. The date of the maximum discharge is not always certain but is usually determined by comparison with nearby continuous-record stations, weather records, or local inquiry. Only the maximum discharge for each water year is given. Information on some lower floods may have been obtained but is not published herein. The years given in the period of record represent water years for which the annual maximum has been determined.

Annual maximum discharge at crest-stage partial-record stations

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Annual maximum		
					Date	Gage Height (feet)	Discharge (cfs)
Streams tributary to Lake Superior							
4-0410	Perch River near Sidnaw, Mich.	NE¼ sec.34, T.48N., R.35 W., at State Highway 28, 2½ miles east of Sidnaw.	63.1	1913-15‡, 1957-68	9-10-68	9.20	325
4-0423	Sturgeon River near Pelkie, Mich	On line between Secs. 2 and 11, T.51N., R.34W.,2 3/4 miles northeast of Pelkie	506	1958-68	7-17-68	a12.77	b4000
*4-0973.7	Flowerfield Creek at Flowerfield, Mich.	SW¼ sec.1, T.5S., R.12 W., at Flowerfield Rd., at Flowerfield	42.6	1964-68	2-2-68	2.30	74
Streams Tributary to Lake Michigan							
4-1245	East Branch Pine River nr. Tustin, Mich	NE¼ NW¼ sec.28, T.20N., R.10 W., 75 ft downstream from highway bridge, 3.0 miles west of Tustin	c63	1953-63‡, 1964-68	2-2 -68	4.28	300
4-1250	Pine River near LeRoy, Mich.	SW¼ SE¼ sec.6, T.19N., R.10 W., 15 ft downstream from highway bridge, 5.0 miles northwest of LeRoy	118	1953-63‡, 1964-68	2-2 -68	5.08	395
Streams Tributary to Lake Huron							
4-1386	Gamble Creek at Lupton Mich.	SW¼ sec.36, T.24N., R.3 E., at bridge ¼ mile south of Lupton	9.47	1953-56, 1959-68	3-27-68	3.50	58
4-1387	Bixby Creek near Rose City, Mich	NW¼ sec.31, T.24N., R.3 W., at bridge on State Highway 33, 1 mile north of Rose City	2.68	1953-68	2-2 -68	3.47	120

*Also a low-flow partial-record station.
‡Operated as a continuous-record gagging station.
a Occurred Mar. 20, 1968 (ice jam).
b Computed on basis of correlations with other stations.
c Approximately.

Annual maximum discharge at crest-stage partical-record stations--Continued

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Annual maximum		
					Date	Gage height (feet)	Discharge (cfs)
		Streams Tributary to Lake Huron--continued					
4-1388	Houghton Creek at Rose City, Mich.	NE¼ sec.6, T.23 N., R.3 E., at bridge, ¼ mile east of Rose City	13.3	1953-68	2-2 -68	1.93	192
4-1389	Wilkins Creek near Rose City, Mich.	NE¼ sec.7, T.23 N., R.3 E., at bridge on State Highway 33, 1 mile south of Rose City	9.15	1953-68	2-2 -68	2.57	116
4-1402	Klacking Creek near Selkirk, Mich.	NE¼ sec.2, T.22 N., R.2 E., at bridge 3 3/4 miles northwest of Selkirk	7.51	1953-68	2-2 -68	1.44	70
4-1411	Shepards Creek near Selkirk, Mich	SE¼ sec.8, T.22 N., R.3 E., at bridge 1 mile southwest of Selkirk	4.44	1953-68	2-2 -68	3.24	56
4-1455	Bad River near Brant, Mich.	NW¼ sec.3, T.10 N., R.2 E., at Hemlock Rd., 2½ miles north of Brant	c89	1948-59‡, 1961-68	2-4 -68	14.18	2,050
*4-1484	Thread Creek near Holly, Mich.	See previous table	12.2	1961-68	2-4 -68	3.17	31
		Streams tributary to St. Clair River					
4-1600	Mill Creek near Abbottsford, Mich	NW¼ sec. 17, T.7 N., R.16 E., at bridge, 1 mile upstream from mouth and 2 miles northeast of Abbottsford.	208	1947-64‡, 1965-68	2-2 -68	10.0	3,640
		Streams tributary to Lake St. Clair					
*4-1617.6	West Branch Stony Creek near Washington, Mich.	SE¼ sec.25, T.4 N., R.11 E., at bridge on Huron-Clinton Metropolitan Park Rd., and 3.4 miles west of Washington.	22.5	1965-68	2-1 -68	(d)	b180
4-1642.5	Tupper Brook at Ray Center, Mich.	NW¼ sec.23, T.4 N., R.13 E., at bridge on 29-Mile Rd., at Ray Center	8.62	1959, 1960-64‡, 1965-68	2-2 -68	7.05	495
4-1644	Deer Creek near Meade Mich.	NW¼ sec.6, T.3 N., R.14 E., at bridge on 25½ Mile Rd 0.9 mile southeast of Meade	12.7	1959-60, 1961-65‡, 1966-68	6-26-68	e7.95	548
4-1644.5	McBride Drain near Macomb, Mich.	NE¼NE¼ sec.16, T.3 N., R.13 E., at bridge on 24 Mile Rd., 2.2 miles southeast of Macomb	5.79	1960-64‡, 1965-68	6-26-68	9.55	180
4-1652	Gloede Ditch near Waldenburg, Mich.	SW¼ sec.32, T.3 N., R.13 E., 2.2 miles south of Waldenburg	16.0	1959, 1960-64‡, 1965-68	6-26-68	18.40	600

*Also a low-flow partial-record station.
‡Operated as a continuous-record gaging station.
b Computed on basis of correlations with other stations.
c Approximately
d Peak stage not recorded
e Maximum gage height, 8.48 ft Feb. 2, 1968 (backwater from ice).

Measurements at miscellaneous sites

Measurements of streamflow at points other than gaging stations or partial-record stations are given in the following table. Those that are measurements of base flow are designated by an asterisk (*); measurements of peak flow by a dagger (†).

Discharge measurements made at miscellaneous sites during water year 1968

Stream	Tributary to	Location	Drainage area (sq mi)	Measured previously (water year)	Measurements	
					Date	Discharge (cfs)
Streams tributary to Lake Superior						
East Branch Sleepy Creek	Sleepy Creek	SE1/4 NE1/4 sec.31, T. 52 N., R.36 W., 1,000 ft east of Copper Range Railroad track, at State Highway 26.	a 1		8-12-68	* 0.07
North Branch Sleepy Creek	do	SW1/4 NE1/4 sec.31, T.52 N., R.36 W., at Copper Range Railroad Bridge, 1,200 ft north of State Highway 26.	a 2		8-12-68	* .13
Sleepy Creek	East Sleeping River	NW1/4 SE1/4 sec.31, T.52 N., R.36 W., 1,000 ft east of Copper Range Railroad track, at State Highway 26.	a 3		8-12-68	* 1.15
Sleepy Creek	do	SE1/4 NW1/4 sec.31, T.52 N., R.36 W., at Copper Range Railroad bridge, 700 ft north of State Highway 26.	a 6		8-12-68	* 2.08
Two Hearted River	Lake Superior	NW1/4 NE1/4 sec.31, T.49 N., R.10 W., at County Road 407 at High Bridge.			10-30-67	150
Streams tributary to Lake Michigan						
Squaw Creek	Escanaba River	NW1/4 sec.19, T.42 N., R.23 W., below unnamed tributaries, 2.5 miles north of County Road 430.			12-13-67	* 3.68
do	do	SE1/4 sec.6, T.41 N., R. 23 W., 500 ft upstream from mouth, 5.0 miles north of Cornell, Mich.	a 22	1967	12-13-67	* 6.61
Portage Creek	Little Bay de Noc	SE1/4 SW1/4 sec.1, T.39 N., R.22 W., at State Highway 35, 0.4 mile upstream from mouth at Escanaba, Mich.	a 30		9-25-68 9-25-68 9-26-68	30.6 29.5 26.6
Portage Creek	Kalamazoo River	On a line between secs. 22 and 27, T.2 S., R.11 W., on Reed Ave. in Kalamazoo, Mich.	a 48	1947-58‡	5- 9-68 5-17-68 5-29-68 6-14-68 7-12-68 7-26-68 8-23-68	* 45.2 53.2 * 66.2 * 36.0 41.8 63.7 * 39.3
do	do	SE1/4 sec.15, T.2 S., R. 11 W., at railroad bridge 0.2 mile above mouth, in Kalamazoo, Mich.			5-17-68 5-29-68 6-14-68 7-12-68 8-23-68	58.7 * 64.8 * 39.4 48.0 * 48.7
Little Rabbitt River	do	NW1/4 sec.22, T.4 N., R.13 W., 1/2 mile southeast of Burnips, Mich.			7-26-68	21.3

* Base flow.
a Approximately.
‡ Operated as a continuous-record gaging station.

Discharge measurements made at miscellaneous sites during water year 1968--Continued

Stream	Tributary to	Location	Drainage area (sq mi)	Measured previously (water year)	Measurements	
					Date	Discharge (cfs)
Streams tributary to Lake Michigan--Continued						
Gun Lake Outlet b/	Gun River	NW1/4 sec.6, T.2 N., R.10 W., near Shelbyville, Mich.	a 30	1943-44, 1946-67	10-11-67 12-13-67 2-20-68 4-30-68 9-17-68	* 14.4 61.4 * 36.8 * 24.4 * 2.32
Frayer Creek	Grand River	SE1/4 sec.26, T.5 N., R. 5 W., at Tupper Lake Rd., 2.4 miles north of Mulliken, Mich.	11.3	1965-66	10- 5-67 3- 6-68 4-29-68	* .12 * .95 * 4.38
Little Maple River	Maple River	W1/2 sec.22, T.6 N., R.1 W., at Alward Rd., 2.8 miles west of Laingsburg, Mich.		1966	10- 4-67 3- 6-68 5- 1-68 9- 4-68	* .22 * .63 * 2.12 * .36
do	do	NW1/4 sec.10, T.6 N., R. 1 W., at Price Rd., 4.8 miles northwest of Laingsburg, Mich.	7.90	1965-66	10- 4-67 3- 6-68 5- 1-68 9- 4-68	* .78 * 1.88 * 5.27 * 1.73
do	do	SE1/4 sec.28, T.7 N., R. 1 W., at Taft Rd., 3.0 miles south of Shepardsville, Mich.		1966	10- 4-67 3- 6-68 5- 1-68 9- 4-68	* 1.32 * 3.86 * 9.00 * 2.22
Croel Lake Outlet	Grand River	SW1/4 sec.27, T.7 N., R. 6 W., at Guernsey Lake Rd., 3.4 miles south of Lyons, Mich.	2.62	1965-67	10- 5-67 3- 6-68 4-29-68 9- 6-68	* .09 * 4.19 * 1.5 0
Manistee River	Lake Michigan	SW1/4 sec.18, T.29 N., R. 4 W., at highway culvert, 8 miles southeast of Alba, Mich.	a 44	1954	8-14-68	* 17.6
do	do	NW1/4 sec.6, T.27 N., R. 4 W., at Red Bridge, 4 1/2 miles west of Frederic, Mich.	71.4	1954	8-14-68	*116
Portage Creek	Manistee River	SW1/4 sec.22, T.26 N., R. 5 W., 1/4 mile above Manistee River and 9 1/2 miles west of Grayling, Mich.	35.4	1954	8-14-68	* 26.3
Manistee River	Lake Michigan	SW1/4 sec.25, T.26 N., R. 6 W., at CCC Bridge, 5 miles northeast of Sharon, Mich.	a215	1954	8-14-68	*256
North Branch Manistee River	Manistee River	SE1/4 sec.6, T.25 N., R. 6 W., near mouth, and 1/2 mile north of Sharon, Mich.	a 95	1954	8-14-68	26.4
Manistee River	Lake Michigan	SW1/4 sec.6, T.25 N., R. 6 W., at highway bridge, at Sharon, Mich.	a435	1954	8-14-68	336
Betsie River	do	Sec.5, T.25 N., R.12 W., at highway bridge, 1 mile northwest of Karlin, Mich.	59.6	1944-67	10- 3-67 1- 3-68 4-12-68 7-22-68	* 37.5 71.0 85.4 43.4

a Approximately.
* Base flow.
b Published as Gun River, 1953.

Discharge measurements made at miscellaneous sites during water year 1968--Continued

Stream	Tributary to	Location	Drainage area (sq mi)	Measured previously (water year)	Measurements	
					Date	Discharge (cfs)
Streams tributary to Lake Michigan--Continued						
Betsie River	Lake Michigan	NW1/4 sec.19, T.25 N., R. 14 W., 50 ft. upstream from bridge on State Highway 115, and 4 3/4 miles southeast of Benzonia, Mich.	158	1958, 1960-67	10- 5-67 1-16-68 4- 8-68 7- 8-68	*138 *151 249 *162
Brundage Creek	Platte River	SW1/4 SE1/4 sec.7, T. 26 N., R.13 W., 700 ft. downstream from Stanley Creek, 0.5 mile upstream from mouth, 4.7 miles east of Honor, Mich.	12.5	1957, 1966-67	10- 3-67 11- 9-67 12- 4-67 1-16-68 2- 8-68 3-11-68 4- 8-68 5- 6-68 6- 4-68 7- 8-68 8- 5-68 9- 9-68	* 18.6 19.7 * 17.1 * 17.0 * 16.1 * 16.0 * 16.6 * 16.7 * 16.1 * 15.4 * 14.4 * 16.4
Platte River	Platte Lake	NE1/4 sec.7, T.26 N., R. 14 W., 1/2 mile west of Honor, Mich., and 2 miles upstream from Platte Lake.	118	1958	8-27-68	96.2
South Branch Boardman River	Boardman River	SE1/4 sec.4, T.26 N., R. 9 W., above mouth of North Branch and 6.2 miles northwest of South Boardman, Mich.	46.7		8-17-68	* 33.7
North Branch Baordman River	do	SE1/4 sec.4, T.26 N., R. 9 W., above mouth of South Branch, and 6.2 miles northwest of South Boardman, Mich.	75.2		8-17-68	* 36.7
Little Rapid River	Rapid River	SE1/4 sec.31, T.28 N., R. 7 W., just above impoundment and 3 1/2 miles north of Kalkaska, Mich.	25.6		8-15-68	* 21.6
Rapid River	Torch River	NW1/4 sec.32, T.28 N., R. 7 W., at highway bridge and 3 1/2 miles north of Kalkaska, Mich.	112		8-15-68	* 40.1
Jordan River	Lake Charlevoix	SE1/4 sec.30, T.31 N., R. 5 W., at roadside park, 1/2 mile upstream from unnamed tributary, and 5.5 miles west of Elmira, Mich.	11.5		8-12-68	* 29.9
do	do	NE1/4 sec.9, T.30 N., R. 6 W., at Pinney Bridge and 4 miles northwest of Alba, Mich.	29.6		8-12-68	*103
do	do	SE1/4 sec.32, T.31 N., R. 6 W., at highway culverts near public fishing site, 6.1 miles northwest of Alba, Mich.			2-15-68 3-18-68 4-18-68 5-13-68 6-10-68 7- 8-68 8-12-68 9-16-68	*151 167 *150 *144 *146 *142 *144 *141
do	do	NE1/4 sec.29, T.31 N., R. 6 W., at Chastonia Bridge, 7.2 miles southeast of East Jordan, Mich.	50.9		8-12-68	*144

* Base flow.

Discharge measurements made at miscellaneous sites during water year 1968--Continued

Stream	Tributary to	Location	Drainage area (sq mi)	Measured previously (water year)	Measurements	
					Date	Discharge (cfs)
Streams tributary to Lake Huron						
Thunder Bay River	Lake Huron	NE1/4 of the SE1/4 sec.15, T.30 N., R.2 E., below Lake Fifteen, 2 miles southwest of Atlanta, Mich.			8-20-68	88.9
do	do	NE1/4 of the SW1/4 sec.7, T.30 N., R.2 E., above confluence of Haymeadow Creek, at Atlanta, Mich.			8-20-68	85.8
Upper South Branch Thunder Bay River	do	SE1/4 sec.23, T.31 N., R. 5 E., at State Highway 32, 3.5 miles southwest of Lachine, Mich.			8-20-68	174
Sugar River	Tittabawassee River	SW1/4 sec.21, T.20 N., R. 1 W., at Hockaday Road Bridge, 9.3 miles north of Gladwin, Mich.	a 20		5-15-68 9-16-68	27.9 * 16.1
Salt River	do	NW1/4 NE1/4 sec.23, T. 15 N., R.1 W., at highway bridge, 0.6 mile upstream from mouth, and 0.8 mile northwest of Sanford, Mich.	a175	1967	10- 3-67	* 19.9
Streams tributary to Lake St. Clair						
Judah Lake Inlet	Sashabaw Creek	NW1/4 sec.33, T.4 N., R. 10 E., at Joslyn Rd., 0.4 mile south of Eames, Mich.			3- 6-68	* .24

a Approximately.
* Base flow.

Low-flow investigation in River Rouge basin, Mich.

On Apr. 22, 23, 1968, a series of discharge measurements was made at many selected locations in the River Rouge basin as part of a water-resources investigation carried on in cooperation with the U. S. Army Engineers District, Detroit, Corps of Engineers, Detroit, Michigan. The purpose of the measurements is to determine the occurrence, distribution, and magnitude of dry-weather streamflow. The measurements are believed to be unaffected by surface runoff due to antecedent precipitation, and thus represent base flow. These results, along with streamflow records, ground water records and geologic studies serve as a ground-water reconnaissance aid and an indication of the water-supply potential of the area with particular reference to sustained flow.

The drainage areas shown were determined from U. S. Geological Survey topographic maps having scales of 1:24,000 or 1:62,500 and a contour interval of 5 or 10 feet.

Discharge measurements made in River Rouge basin, Mich. Apr. 22, 23, 1968

Stream	Location	Drainage area (sq mi)	Discharge (cfs)	Cfs per square mile
River Rouge tributary	NE¼ sec.26, T.2 N., R.10 E., at Quarton Rd., at Birmingham.	21.5	10.6	0.493
River Rouge	NW¼ sec.36, T.2 N., R.10 E., at gaging station at West Maple Rd., at Birmingham.	36.9	16.9	.458
Franklin Branch	NW¼ sec.9, T.1 N., R.10 E., at Thirteenmile Rd., at Franklin	15.4	11.8	.766
Pebble Creek	NE¼ sec.30, T.1 N., R.10 E., at Tenmile Rd., 1.4 miles southwest of Southfield.	10.3	5.35	.519
River Rouge	SW¼ sec.32, T.1 N., R.10 E., at gaging station at Beech Rd., at Southfield.	87.9	49.9	.568
Evans Ditch	SE¼ sec.28, T.1 N., R.10 E., at gaging station at Ninemile Rd., at Southfield	9.49	3.29	.347
Minnow Pond Drain	SW¼ sec.15, T.1 N., R.9 E., at Farmington Rd., at Quakertown	9.18	3.62	.394
Upper River Rouge	NW¼ sec.27, T.1 N., R.9 E., at gaging station at Shiawassee Rd., at Farmington	17.5	10.1	.577
do	N½ sec.20, T.1 S., R.10 E., at Fenkell Rd., at Redford	22.2	14.8	.667
Bell Branch	NW¼ sec.13, T.1 S., R.9 E., at Middle Belt Rd., 2.1 miles northeast of Livonia	20.2	7.44	.368
Tarabusi Creek	SW¼ sec.12, T.1 S., R.9 E., at Middle Belt Rd., 2.2 miles northeast of Livonia.	6.68	4.91	.735
Bell Branch	SW¼ sec.20, T.1 S., R.10 E., at Beech-Daly Rd., at Redford.	40.8	13.2	.324
River Rouge	SW¼ sec.27, T.1 S., R.10 E., at Plymouth Rd., in Detroit.	187	78.3	.419
Walled Lake Branch	NE¼ sec.22, T.1 N., R.8 E., at Novi Rd., at Novi.	9.75	8.39	.861
do	SW¼ sec.35, T.1 N, R.8 E., at Novi Rd., at Northville.	22.1	14.1	.638
Johnson Drain	SE¼ sec.24, T.1 S., R.7 E., at Napier Rd., 1.2 miles east of Brookville.	11.5	6.05	.526
do	SE¼ sec.3, T.1 S., R.8 E., at Sevenmile Rd., at Northville.	26.1	12.7	.487
Middle River Rouge	SW¼ sec.25, T.1 S., R.8 E., at Haggerty Rd., at Plymouth	60.7	39.1	.644
Willow Creek	NE¼ sec.7, T.2 S., R.9 E., at Tonquish Rd., 2.6 miles southwest of Nankin Mills.	6.74	2.22	.329
Tonquish Creek	NW¼ sec.4, T.2 S., R.9 E., at Wayne Rd., at Nankin Mills	24.2	8.97	.371

Low-flow investigation in River Rouge basin, Mich. —continued

Discharge measurements made in River Rouge basin, Mich. Apr. 22, 23, 1968

Stream	Location	Drainage area (sq mi)	Discharge (cfs)	Cfs per square mile
Middle River Rouge	NW¼ sec.6, T.2 S., R.10 E., at gaging station at Inkster Rd., 1.8 miles northeast of Garden City.	99.9	54.6	.547
Lower River Rouge	SW¼ sec.28, T.2 S., R.8 E., at Beck Rd., 1.6 miles northwest of Sheldon	9.01	2.44	.271
Fowler Creek	SW¼ sec.28, T.2 S., R.8 E., at Beck Rd., 1.5 miles northwest of Sheldon.	12.0	2.38	.198
Lower River Rouge	SW¼ sec.25, T.2 S., R.8 E., at Haggerty Rd., 1.5 miles east of Sheldon	37.5	10.1	.269
Fellows Creek	NE¼ sec.25, T.2 S., R.8 E., at Palmer Rd., 2.7 miles northwest of Wayne.	16.0	4.64	.290
Lower River Rouge	S½ sec.19, T.2 S., R.10 E., at gaging station at John Daly Rd., at Inkster	83.2	21.0	.252
do	Land grant 665, T.2 S., R.10 E., at South Brady Rd., at Dearborn.	91.9	21.5	.234

Page
Accuracy of field data and computed results 8
Acre-foot, definition of 3
Augusta Creek, near Augusta 95
near Hickory Corners 236
Arms Creek near Hamburg 239
Au Gres River, East Branch, at McIvor 151
near National City 152
Au Sable River, at Grayling 147
at Mio 150
East Branch, at Grayling 148
North Branch, near Lovells 237
South Branch, near Luzerne 149
Bad River near Brant 241
Battle Creek at Battle Creek 93
Bean Creek at Powers, Ohio 233
Bear Creek (tributary to Manistee River) near Brethren 236
Bear Creek (tributary to Maple River) near Ovid . 236
Bear Creek, (tributary to Muskegon River) near Muskegon 124
at North Muskegon 236
Belle River at Memphis 188
North Branch, at Imlay City 187
Big Beaver Creek near Warren 198
Big Creek (tributary to Chocolay River) near Harvey 234
Big Creek near Lovells 237
Big Sable River near Freesoil 127
Big Spring near Manistique 235
Bixby Creek near Rose City 240
Black River (tributary to Cheboygan River), near Cheboygan 142
near Tower 140
East Branch, near Atlanta 237
Black River (tributary to Lake Michigan) near Bangor 91
Black River (tributary to Lake Michigan) near Garnet 40
Black River (tributary to Lake Michigan) near Zeeland 102
Black River (tributary to Lake Superior) near Bessemer 19
near Republic 47
Black River (tributary to St. Clair River) near Croswell 238
near Fargo 185
Boardman River near Mayfield 133
Bond Falls Canal near Paulding 23
Bond Falls Reservoir near Paulding 24
Brule River near Florence, Wis. 58
Caribou Creek near Detour Village 237
Carp Creek at Ishpeming 234
Carp River near Negaunee 37
North Fork, near Fibre 237
Cass River, at Cass City 173
at Frankenmuth 175
at Vassar 174
South Branch, near Cass City 172
Cedar Creek near Harvey 234
Cfs-day, definition of 3
Cheboygan River near Cheboygan 139
Cherry Creek near Harvey 38
Chippewa River, near Midland 179
near Mount Pleasant 178
Clam River at Vogel Center 120
Clinton River, at Auburn Heights 191
at Clarkston 238
at Mount Clemens 212
at Yates 238
near Drayton Plains 190
near Fraser 200
Middle Branch, at Macomb 211
near Macomb 210
North Branch, at Almont 201
near Meade 204
near Mount Clemens 209
near Romeo 202
Coldwater River, (tributary to St. Joseph River), near Hodunk 75
Computations, accuracy of results of 8
Comstock Creek near Kalamazoo 236
Contents, definition of 3

Page
Control, definition of 3
Coon Creek, near Armada 205
East Branch, at Armada 206
near New Haven 208
Cooperation 2
Crest-stage partial-record stations 240,241
Cubic foot per second, definition of 3
Cubic foot per second per square mile, definition of 3
Data, accuracy of 8
Davis Creek near South Lyon 239
Deer Creek (tributary to Red Cedar River) near Dansville 105
Deer Creek (tributary to North Branch Clinton River) near Meade 241
Deer Lake Outlet at Clarkston 238
Definition of terms and abbreviations 3
Detroit River, streams tributary to, gaging-station records ... 213-219
low-flow partial-record 238
Dishno Creek near Champion 235
Dowagiac River at Sumnerville 89
Downstream order and station numbers 4
Drainage area, definition of 4
Duck Creek at Ortonville 237
Duck Creek near Hiawatha 234
East Pond Creek at Romeo 203
Elkhart River, at Goshen, Ind. 86
North Branch, near Cosperville, Ind. 85
Escanaba River, at Cornell 55
East Branch at Gwinn 54
Middle Branch, at Humboldt 46
near Greenwood 235
near Ishpeming 48
near Princeton 49
Evans Ditch at Southfield 215
Explanation of data 5-8
Farmers Creek near Lapeer 164
Fawn River near White Pigeon 82
Flat River at Smyrna 113
Flint River near Alicia 171
near Flint 169
near Fosters 170
near Otisville 166
Flowerfield Creek at Flowerfield 235,240
Ford River near Hyde 56
Franklin Branch at Franklin 238
Gaging station, definition of 3
Galloway Creek near Auburn Heights 192
Gamble Creek at Lupton 240
Gloede Ditch near Waldenburg 241
Goose Lake Outlet near Negaunee 235
Goose Lake Outlet near Sands Station 53
Gourdneck Canal near Schoolcraft 78
Gourdneck Creek, near Schoolcraft 79
near Vicksburg 235
Grand River, at Grand Rapids 118
at Ionia 112
at Jackson 103
at Lansing 108
at Portland 109
near Eaton Rapids 104
Gull Creek near Galesburg 96
Hamilton Creek near Loretto 235
Highbank Creek near Armada 207
Hobart Drain near Eaton Rapids 236
Holland Creek near Germfask 234
Holloway Reservoir near Otisville 165
Houghton Creek, at Rose City 241
near Lupton 153
Hunt Creek near Lewiston 237
Huron River, at Ann Arbor 228
at Commerce 220
at Milford 221
near Andersonville 239
near Dexter 226
near Drayton Plains 239
near Hamburg 224
near New Hudson 222
Hydrologic conditions 10
graph of 11

Page
Indian River (tributary to Cheboygan River) at Indian River 136
Indian River (tributary to Manistique River) near Manistique 44
Iron River at Caspian 57
Judah Lake Outlet near Eames 238
Jordan River near East Jordan 134
Kalamazoo River, at Comstock 97
at Marshall 92
near Battle Creek 94
near Cooper Center 236
near Fennville 100
Kawkawlin River, North Branch, near Kawkawlin .. 159
Kearsley Creek, at Ortonville 237
near Davison 167
Klacking Creek near Selkirk 241
Lake Erie, streams tributary to, gaging-station records 220-233
low-flow partial-record stations 239
Lake Huron, streams tributary to, crest-stage partial-record stations 240,241
gaging station records 135-184
low-flow partial-record stations 237
measurements at miscellaneous sites 245
Lake Michigan, streams tributary to, crest-stage partial-record stations 240
gaging station records 40-134
low-flow partial-record stations 234-237
measurements at miscellaneous sites 242-244
Lake St. Clair, streams tributary to, crest-stage partial-record stations 241
gaging station records 189-212
low-flow partial-record stations 238
Lake Superior, streams tributary to, crest-stage partial-record stations 240
gaging station records 14-39
low-flow partial-record stations 234
measurements at miscellaneous sites 242
Lakes and Reservoirs:
Bond Falls Reservoir near Paulding 24
Holloway Reservoir near Otisville 165
Schweitzer Reservoir near Palmer 50
Stony Lake near Washington 196
Libhart Creek near Lyons 236
Little Dead River near Ishpeming 234
Little Lake Outlet at Forsyth 235
Little Libhart Creek near Lyons 236
Little Manistee River near Freesoil 132
Little Maple River near Laingsburg 236
Little Muskegon River near Morley 122
Lookingglass River near Eagle 110
Lower River Rouge at Inkster 219
Low-flow investigations in River Rouge basin. 246,247
Low-flow partial-record stations 234-239
Manistee River, near Grayling 128
near Manistee 131
near Sherman 129
Manistique River, at Germfask 41
near Blaney 42
near Manistique 43
Map of Lower Peninsula of Michigan 13
Map of Upper Peninsula of Michigan 12
Maple River at Maple Rapids 111
McBride Drain near Macomb 241
Mead Creek near Germfask 234
Measurements at miscellaneous sites 242-245
Menominee River, below Koss 73
near Florence, Wis. 67
near Pembine, Wis. 71
Mezick Creek near Blaney 234
Michigamme River, at Republic 64
near Champion 63
near Crystal Falls 66
near Witch Lake 65
Middle River Rouge near Garden City 218
Mill Creek (tributary to Black River), near Abbottsford 241
near Avoca 186

Page
Mill Creek (tributary to Huron River), near Dexter 227
near Lima Center 239
Minnow Pond Drain at Quakertown 238
Montreal River near Saxon, Wis. 18
Morgan Creek near Marquette 234
Mount Vernon Drain near Washington 238
Muskegon River, at Evart 121
at Newaygo 123
near Merritt 119
Norton Creek near Milford 239
Nottawa Creek near Athens 76
Ontonagon River, Cisco Branch, at Cisco Lake Outlet 29
East Branch, near Mass 26
Middle Branch, near Paulding 22
near Rockland 27
near Trout Creek 25
near Rockland 31
South Branch, at Ewen 30
West Branch, near Bergland 28
Order, downstream, of listing gaging stations. 4
Ore Creek near Brighton 223
Other Data Available 9
Otter River near Elo 34
Paint Creek, at Rochester 194
near Lake Orion 193
Paint Creek Drain near Oxford 238
Paint River, at Crystal Falls 59
near Alpha 60
Partial-record station, definition of 3
Paw Paw River at Riverside 90
Pebble Creek near Southfield 238
Perch River near Sidnaw 240
Pere Marquette River at Scottville 126
Perrin Lake Outlet near Sturgis 235
Peshekee River, near Champion 62
near Michigamme 61
Pettibone Creek at Milford 239
Pigeon Creek at Hogback Lake Outlet, near Angola, Ind. 84
Pigeon River (tributary to Indian River), at Afton 138
near Vanderbilt 137
Pigeon River (tributary to Lake Huron) near Owendale 184
Pike River at Amberg, Wis. 72
Pine River (tributary to Chippewa River), at Alma 180
near Midland 181
Pine River (tributary to Manistee River), East Branch, near Tustin 240
near Hoxeyville 130
near Le Roy 240
Pine River (tributary to Menominee River) at Pine River powerplant near Florence, Wis. . 68
Platte River near Honor 237
Plum Brook, at Utica 199
Portage Creek (tributary to Kalamazoo River), near Kalamazoo 98
West Fork, at Kalamazoo 99
Portage Creek tributary near Portage 236
Portage River (tributary to Huron River) near Pinckney 225
near Vicksburg 77
Prairie River near Nottawa 81
Presque Isle River, at Marenisco 20
near Tula 21
Prior Creek near Selkirk 155
Quaker Brook near Nashville 114
Rabbit River near Hopkins 101
Rainy River near Ocqueoc 141
Red Cedar River at East Lansing 107
Reservoirs:
Bond Falls Reservoir near Paulding 24
Holloway Reservoir near Otisville 165
Schweitzer Reservoir near Palmer 50
Stony Lake near Washington 196

Page
Rifle River, near Sterling 158
at Selkirk 156
at "The Ranch", near Lupton 154
River Raisin, near Adrian 230
near Monroe 232
near Tecumseh 229
River Rouge, at Birmingham 213
at Detroit 217
at Southfield 214
low-flow investigation in 246,247
River Rouge tributary at Birmingham 238
Rogue River near Rockford 117
Runoff in inches, definition of 3
St. Clair River, streams tributary to, crest-stage partial-record stations . 241
gaging station records 185-188
low-flow partial-record stations 238
St. Joseph River, at Elkart, Ind. 87
at Mottville 83
at Niles 88
at Three Rivers 80
near Burlington 74
Saginaw River at Saginaw 183
Saline River, at Milan 239
at Saline 239
Saline River near Saline 231
Salt River near North Bradley 177
Sandstone Creek near Jackson 236
Sargent Creek at Rochester 238
Sashabaw Creek near Drayton Plains 189
Schweitzer Creek near Palmer 51
Sessions Creek near Ionia 236
Schweitzer Reservoir near Palmer 50
Shepards Creek, near Selkirk 241
South Branch, near Selkirk 157
Sherman Mill Creek, near Centreville 235
near Sturgis 235
near White Pigeon 235
Shiawassee River, at Byron 161
at Holly 237
at Linden 160
at Owosso 162
near Davisburg 237
near Fergus 163
Sloan Creek near Williamston 106
Spring Brook (tributary to Kalamazoo River) near East Cooper 236
near Richland 236

Page
Spruce River near Republic 235
Stage-discharge relation, definition of 3
Stanley Creek near Iron River 235
Station numbers 4
Stony Creek (tributary to Clinton River), near Romeo 195
near Washington 197
West Branch, near Lakeville, ... 238
West Branch, near Washington 238,241
Stony Lake near Washington 196
Sturgeon River (tributary to Burt Lake) near Wolverine 135
Sturgeon River (tributary to Lake Michigan), near Nahma Junction 45
Sturgeon River (tributary to Lake Superior), near Alston 33
near Arnheim 35
near Pelkie 240
near Sidnaw 32
Sturgeon River (tributary to Menominee River), near Foster City 70
West Branch, near Randville 69
Swartz Creek, near Bayport Park 237
near Holly 168
Tahquamenon River near Tahquamenon Paradise .. 39
Terms and abbreviations, definition of 3,4
Thornapple River, near Caledonia 116
near Hastings 115
Thread Creek near Holly 237,241
Thunder Bay River, near Bolton 144
near Hillman 143
North Branch, near Bolton 145
Tittabawassee River at Midland 182
Tobacco River at Beaverton 176
Trap Rock River near Lake Linden 36
Tupper Brook at Ray Center 241
Twin Lakes Outlet near Washington 238
Upper River Rouge at Farmington 216
Walled Lake Branch at Northville 238
Warner Creek near Palmer 52
Washington Creek at Windigo 14
White River near Whitehall 125
Wilkins Creek near Rose City 241
WSP, definition of 4

GPO 817-436-17

UNIVERSITY OF ILLINOIS-URBANA
551.483UN32WMI C001
WATER RESOURCES DATA FOR MICHIGAN$LANSIN
1967/68 PT.1
3 0112 007584086